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CRANGONID SHRIMPS (CRUSTACEA: CARIDEA), WITH A DESCRIPTION OF A NEW SPECIES OF *PONTOCARIS*

By

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ABSTRACT

A single species of crangonid shrimp, *Pontophilus gorei*, was captured during the 28-month Hourglass sampling program on the West Florida continental shelf. Examination of the literature and of material at the National Museum of Natural History and in Texas A&M University collections revealed six additional crangonid species from the deeper water beyond the shelf in the Gulf of Mexico and Caribbean: *Sabinea tridentata*, *Pontophilus brevirostris*, *P. gracilis*, *P. talismani*, *Pontocaris caribbaea* and *Pontocaris vicina* n. sp. All species are diagnosed, illustrated and accompanied by synonymies. A key to the known genera of Crangonidae and an illustrated key to the seven species known from the Gulf of Mexico are provided.

Population abundance of *Pontophilus gorei* was greatest at the 73 m Hourglass stations and decreased successively at the 55 m and the 37 m stations. The monthly distribution of ovigerous females indicates an extended breeding season.

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INTRODUCTION

The earliest offshore collections in the Gulf of Mexico were dredged by the U.S. Coast Survey steamer *Blake* between 1877 and 1880. Caridean portions of these collections were reported on by A. Milne Edwards (1881), Smith (1882) and Faxon (1896). It was again Smith (1881; 1884; 1887) who reported on the Caridea collected from the Western Atlantic, Gulf of Mexico and Caribbean Sea by the U.S. Fish Commission vessels *Albatross* and *Fish Hawk*. Although Smith (1881; 1882; 1884) described several new species of crangonids from the Western Atlantic and Boone (1927) described a new species, *Aegeon caribbaeus* (=*Pontocaris caribbaea*) from the collections of the *Pawnee I* in the Caribbean, only *Pontophilus gracilis* Smith, 1882, was known from the Gulf of Mexico prior to 1956 (Faxon, 1896; *Blake* Stations 43, 47, and 48). Not until the Bureau of Commercial Fisheries vessels *Oregon* and *Combat* began sampling in the Gulf during the 1950's were additional crangonids collected. *Pontocaris caribbaea* (Boone, 1927) and *Pontophilus brevirostris* Smith, 1881, were reported for the first time from the Gulf of Mexico in a faunal list published by Chace (1956). Thompson (unpublished dissertation, 1963) compiled Bureau records and systematically treated the bathyalbenthic carideans of the southwest North Atlantic including those of the Gulf of Mexico. Additional Gulf and Caribbean records for *P. caribbaea* were reported by Bullis and Thompson (1965).

During the 1960's, the *Alaminos* of Texas A&M University sampled extensively in the Gulf of Mexico. Carideans collected as a result of this effort were reported on by Pequegnat (1970) and Pequegnat et al. (1971). Pequegnat's (1970) report, the first published treatment of all known Crangonidae in the Gulf, included the description of a new species, *Sabinea tridentata*. *Pontophilus abyssi* Smith, 1884, was reported from the Gulf for the first time, but these specimens later proved to be *P. talismani* Crosnier and Forest, 1973.

In the mid 1960's, the Florida Department of Natural Resources Marine Research Laboratory began "Project Hourglass," an exhaustive survey of the flora and fauna of the shelf area off central western Florida. As a result of these comparatively shallow collections, *Pontophilus gorei*, the fourth species of *Pontophilus* reported from the Gulf, was discovered and described (Dardeau, 1980), bringing the number of crangonids known from the Gulf of Mexico to six.

While examining material for inclusion in this report, a new species of *Pontocaris* was recognized among specimens collected by the *Oregon* from the Gulf of Mexico and Caribbean and is described herein. Descriptive data, references and distribution records are presented for each of the Gulf of Mexico crangonids. Aspects of the reproductive biology and the seasonal size structure of a population of *Pontophilus gorei* are also discussed.

ACKNOWLEDGMENTS

It is our pleasure to acknowledge Dr. T. S. Hopkins (under Bureau of Land Management contract AA550-CT7-34), Dauphin Island Sea Lab, Dr. J. N. Kraeuter, Virginia Institute of Marine Science, R. Lemaitre, Florida International University, and Dr. R. H. Gore, the Smithsonian Institution, Fort Pierce Bureau, for the loan of specimens. We are particularly indebted to W. G. Lyons and D. K. Camp, Florida Department of Natural Resources Marine Research Laboratory, Dr. L. H. Pequegnat, Texas A&M University, and Dr. B. Kensley, National Museum of Natural History, for access to their institutions' collections as well as for editorial comment and review. We thank B. Heard (Figures 2-9 and 13-15) and L. B. Lutz (Figures 10-12 and 16-20) for providing the illustrations. Sharon Wilson expertly typed the manuscript, and Joan Durfee proofed the final draft.

MATERIALS AND METHODS

Most specimens of *Pontophilus gorei* examined were from the Hourglass collections, monthly dredge and trawl samples taken over a 28-month period at ten stations offshore from Tampa Bay and Sanibel Island. Stations were located on two transects 160 km apart at depths of 6, 18, 37, 55, and 73 m (Figure 1). Coordinates and depths of the stations are given in Table. Samples were

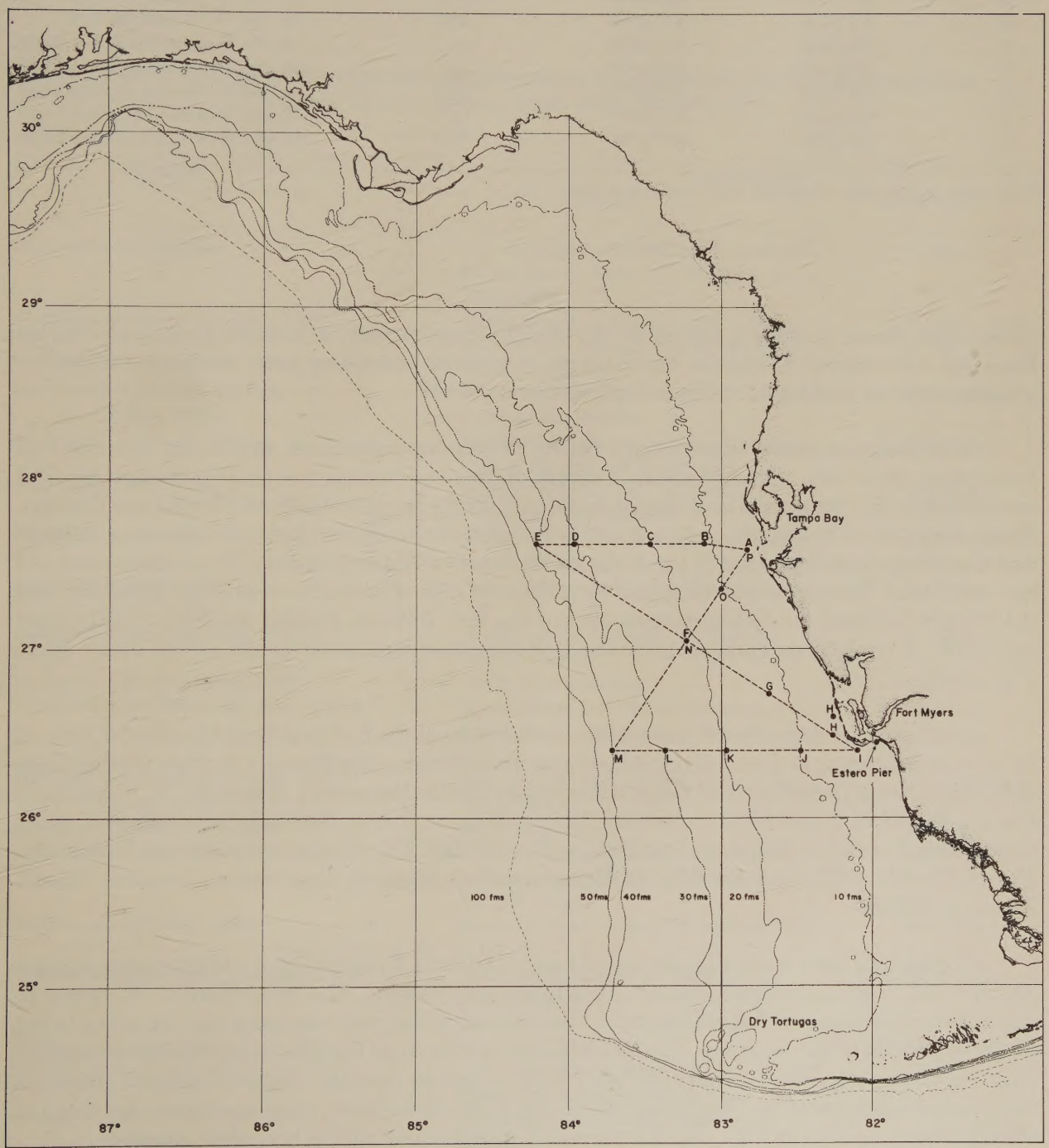

Figure 1. Hourglass cruise pattern and station locations.

TABLE 1. LOCATIONS AND DEPTHS OF HOURGLASS STATIONS.

Station	Latitude*	Longitude*	Established Depth (meters)	Approximate Nautical Miles Offshore*
A	27°35'N	82°50'W	6.1	4, due W of Egmont Key
B	27°37'N	83°07'W	18.3	19, due W of Egmont Key
C	27°37'N	83°28'W	36.6	38, due W of Egmont Key
D	27°37'N	83°58'W	54.9	65, due W of Egmont Key
E	27°37'N	84°13'W	73.2	78, due W of Egmont Key
I	26°24'N	82°06'W	6.1	4, due W of Sanibel Island Light
J	26°24'N	82°28'W	18.3	24, due W of Sanibel Island Light
K	26°24'N	82°58'W	36.6	51, due W of Sanibel Island Light
L	26°24'N	83°22'W	54.9	73, due W of Sanibel Island Light
M	26°24'N	83°43'W	73.2	92, due W of Sanibel Island Light

*U.S. Coast and Geodetic Chart No. 1003, dated June 1966.

taken from the R/V *Hernan Cortez* by the Florida Department of Natural Resources Marine Research Laboratory. Complete descriptions of stations, sampling gear, methods and hydrographic data are presented in Joyce and Williams (1969).

Other material was obtained from a variety of museum collections. Additional specimens of *Pontophilus gorei* were collected during a survey of the outer continental shelf of the eastern Gulf sponsored by the Bureau of Land Management and during faunal surveys off Florida and Georgia. Most specimens of *Pontocaris* and many of *Pontophilus* were collected by the *Oregon* from the Gulf and Caribbean and deposited in the National Museum of Natural History. Type material of the new species of *Pontocaris* was collected by personnel from Florida International University and the Florida Institute for Oceanography aboard the R/V *Bellows*. Finally, a small but important collection of crangonids made aboard the R/V *Alaminos* was made available by Texas A&M University.

Specimens are deposited in invertebrate collections at the U.S. National Museum of Natural History, Washington, D.C. (USNM); Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands (RMNH); Florida Department of Natural Resources Marine Research Laboratory, St. Petersburg, Florida (FSBC I); Texas A&M University, College Station, Texas (TAMU); Indian River Coastal Zone Study Reference Museum, Fort Pierce, Florida (IRCZS); Florida International University, Miami, Florida (FIU) and the Marine Environmental Sciences Consortium, Dauphin Island, Alabama (MESC).

All drawings were made with the aid of a camera lucida. Synonymies are restricted to original descriptions, regional references and nomenclatural changes. The abbreviation CL refers to carapace length, measured in millimeters from the level of the posterior margin of the orbits to the posterior margin of the carapace. The size of each sex in each lot is given in the *Material examined*. Non-ovigerous females are listed separately from ovigerous females. Although bopyrid parasites were not actually present on Hourglass material of *Pontophilus gorei*, three specimens are listed as infected because they exhibit the characteristic modification of the branchial chamber.

SYSTEMATICS

Seventeen species representing eight genera of Crangonidae are now known from the Western Atlantic and surrounding waters (see Table 2). Of these, three genera (*Sabinea*, *Pontophilus* and *Pontocaris*) and seven species have been collected from the Gulf of Mexico. The following key to Gulf of Mexico crangonids is adapted from Pequegnat's (1970) key to the deep-water species of the Gulf. Only *Pontophilus gorei* is represented in the Hourglass collections. Following the keys to the genera and to the species known to occur in the Gulf of Mexico are systematic accounts of each species known from the Gulf of Mexico.

TABLE 2. SUMMARY OF THE DISTRIBUTIONS OF WESTERN ATLANTIC CRANGONIDAE (ADAPTED FROM WILLIAMS AND WIGLEY, 1977).

Species	Distribution	
	Geographic	Bathymetric
Argis dentata (Rathbun, 1902)	NW Greenland southward to Nova Scotia; Bering Sea to Sitka and SE coast of Kamchatka	0-320 m
Crangon septemspinosa Say, 1818	Baffin Bay to E Florida; arctic Alaska to Shumagin Islands; Sea of Okhotsk; Hokkaido, Japan	0-150 m, rarely to 450 m
Metacrangon jacqueti agassizii (Smith, 1882)	W Atlantic from SE Newfoundland to off Fernandina, Florida	233-4,062 m
Pontocaris caribbaea (Boone, 1927)	Bahama Islands and Straits of Florida; Gulf of Mexico; off Honduras	285-885 m
Pontocaris vicina n. sp.	Bahama Islands; Gulf of Mexico; off Honduras and Nicaragua	366-549 m
Pontophilus abyssi Smith, 1884	W Atlantic off Virginia; Indian Ocean, Bay of Bengal	3,197-5,852 m
Pontophilus brevirostris Smith, 1884	Gulf of Maine to Gulf of Mexico	7-426 m
Pontophilus gorei Dardeau, 1980	W Atlantic off Georgia and Florida; Gulf of Mexico	9-186 m
Pontophilus gracilis Smith, 1882	Nearly cosmopolitan	370-3,440 m
Pontophilus norvegicus (M. Sars, 1861)	Greenland to off Virginia; Iceland; Spitzbergen; NW Europe; Balearic Islands	50-945 m
Pontophilus talismani Crosnier and Forest, 1973	Gulf of Mexico; E Atlantic, near Cape Verde Islands	2,366-3,731 m
Prionocrangon pectinata Faxon, 1896	Off Martinique	1033 m
Sabinea hystrix (A. Milne Edwards, 1881)	W Atlantic from Davis Strait and SW of Iceland to Guadeloupe; E Atlantic, off Spanish Sahara	550-3,600 m
Sabinea sarsii Smith, 1879	Davis Strait to Nantucket; Iceland; N Europe	48-710 m
Sabinea septemcarinata (Sabine, 1824)	Mouth of St. Lawrence River to Massachusetts Bay; Arctic Ocean to Pt. Barrow, Alaska; White Sea and N Europe	10-271 m
Sabinea tridentata Pequegnat, 1970	SE Gulf of Mexico	391 m
Sclerocrangon boreas (Phipps, 1774)	Arctic Ocean southward to Cape Cod and Nantucket; Aleutian Islands and Alexander Archipelago, Alaska; NE Siberia	1-260 m

The key to the genera of the family Crangonidae is modified from Holthuis (1955) to include the genera proposed by Zarenkov (1965) and Kuris and Carlton (1977). *Nectocrangon* Brandt, 1851, is considered as a junior synonym of *Argis* Krøyer, 1842. *Philocheras* Stebbing, 1900, is treated as a junior synonym of *Pontophilus* Leach, 1817 (Dardeau, 1980).

KEY TO THE GENERA OF CRANGONIDAE

1. Second pereopods absent ..... *Paracrangon* Dana, 1852
1. Second pereopods present 2
2. Second pereopods simple, not chelate 3
2. Second pereopods chelate 5
3. Eyes reduced to small, pointed processes; cornea absent ..... *Prionocrangon* Wood-Mason and Alcock, 1891
3. Eyes well-developed; cornea present, large 4
4. Second pereopods rudimentary, thin, short, failing to reach end of merus of first pereopods; scaphocerite with terminal tooth ..... *Sabinea* Ross, 1835
4. Second pereopods broad and rather well-developed, reaching beyond merus of first pereopods; scaphocerite without terminal tooth ..... *Vercoia* Baker, 1904
5. Dactylus of fourth and fifth pereopods flat, broadened, natatory ..... *Argis* Krøyer, 1842
5. Dactylus of fourth and fifth pereopods not broadened 6
6. Second pereopods subequal in length to other pereopods 7
6. Second pereopods much shorter than other pereopods 14
7. Carapace lacking gastric spine or spines ..... *Lissocrangon* Kuris and Carlton, 1977
7. Carapace with 1 or more gastric spines 8
8. Dorsal carinae on sixth abdominal segment reaching to, or extending beyond, posterior margin 9
8. When present, dorsal carinae on sixth abdominal segment not reaching to posterior margin 11
9. Median carina of carapace with 1 spine; body slender; Antarctic ... *Notocrangon* Coutière, 1900
9. Median carina of carapace with 3 or more spines; body robust; Arctic 10
10. Pleopod 2 of male with endopodite distinctly longer than appendix masculina ..... *Rhynocrangon* Zarenkov, 1965
10. Pleopod 2 of male with endopodite reduced to small lobe, much shorter than appendix masculina ..... *Sclerocrangon* Sars, 1883
11. Carapace with 2 gastric spines ..... *Neocrangon* Zarenkov, 1965
11. Carapace with 1 gastric spine 12

12. Carapace with 1 dorsal median spine ..... *Crangon* Fabricius, 1798

12. Carapace with 2 to 4 dorsal median spines 13

13. Sixth abdominal segment cylindrical, approximately twice as long as wide ..... *Mesocrangon* Zarenkov, 1965

13. Sixth abdominal segment stout, expanded posterolaterally into prominent wing-like lobes or keels ..... *Metacrangon* Zarenkov, 1965

14. Six or seven branchiae on each side of body; apices of branchiae directed posteriorly.... *Pontophilus* Leach, 1817

14. Eight branchiae on each side of the body; apices of branchiae directed anteriorly ..... *Pontocaris* Bate, 1888

KEY TO THE CRANGONIDAE OF THE GULF OF MEXICO

1. Second pereopods simple (Figure 15) ..... *Sabinea tridentata* Pequegnat, 1970

1. Second pereopods chelate 2

2. Six or seven branchiae on each side of body; inferior apices directed posteriorly (*Pontophilus*) 3

2. Eight branchiae on each side of body; inferior apices directed anteriorly (*Pontocaris*) ... 6

3. Rostrum with blunt, rounded tip (Figure 2a, d) 4

3. Rostrum with sharp, pointed tip (Figure 2c, e) 5

4. Hepatic spines present (Figure 2a)..... *Pontophilus brevirostris* Smith, 1881

4. Hepatic spines absent (Figure 2d)..... *Pontophilus gorei* Dardeau, 1980

5. Rostrum extending nearly to distal margin of cornea (Figure 2c)..... *Pontophilus gracilis* Smith, 1882

5. Rostrum falling considerably short of distal margin of cornea (Figure 2e)..... *Pontophilus talismani* Crosnier and Forest, 1973

6. Dorsal midline of carapace with four distinct spines (Figure 2f)..... *Pontocaris caribbaea* (Boone, 1927)

6. Dorsal midline of carapace with five distinct spines (Figure 2g)... *Pontocaris vicina* n. sp.

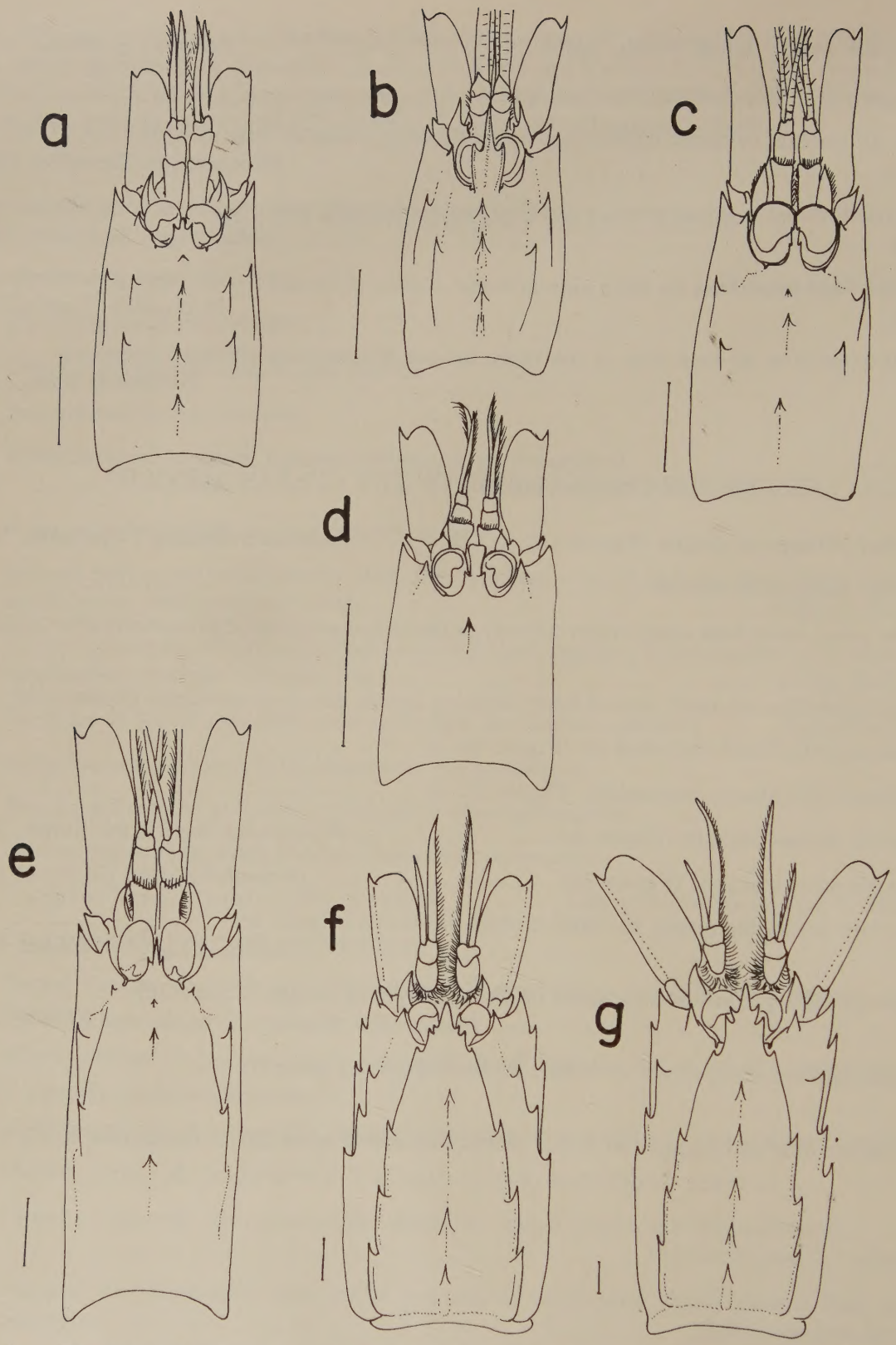

Figure 2. Dorsal view of carapace in seven species of Gulf of Mexico crangonids (all scales equal to 2.0 mm). a. *Pontophilus brevirostris*, ovigerous female, CL 5.6, USNM 57247; b. *Sabinea tridentata*, male, CL 4.0, TAMU 2-2294; c. *Pontophilus gracilis*, female, CL 5.5, TAMU 2-2284; d. *Pontophilus gorei*, female, CL 2.5, FSBC I 23827; e. *Pontophilus talismani*, female, CL 9.0, TAMU 2-6184; f. *Pontocaris caribbaea*, ovigerous female, CL 12.0, USNM 98647; g. *Pontocaris vicina*, ovigerous female, CL 19.0, USNM 189144.

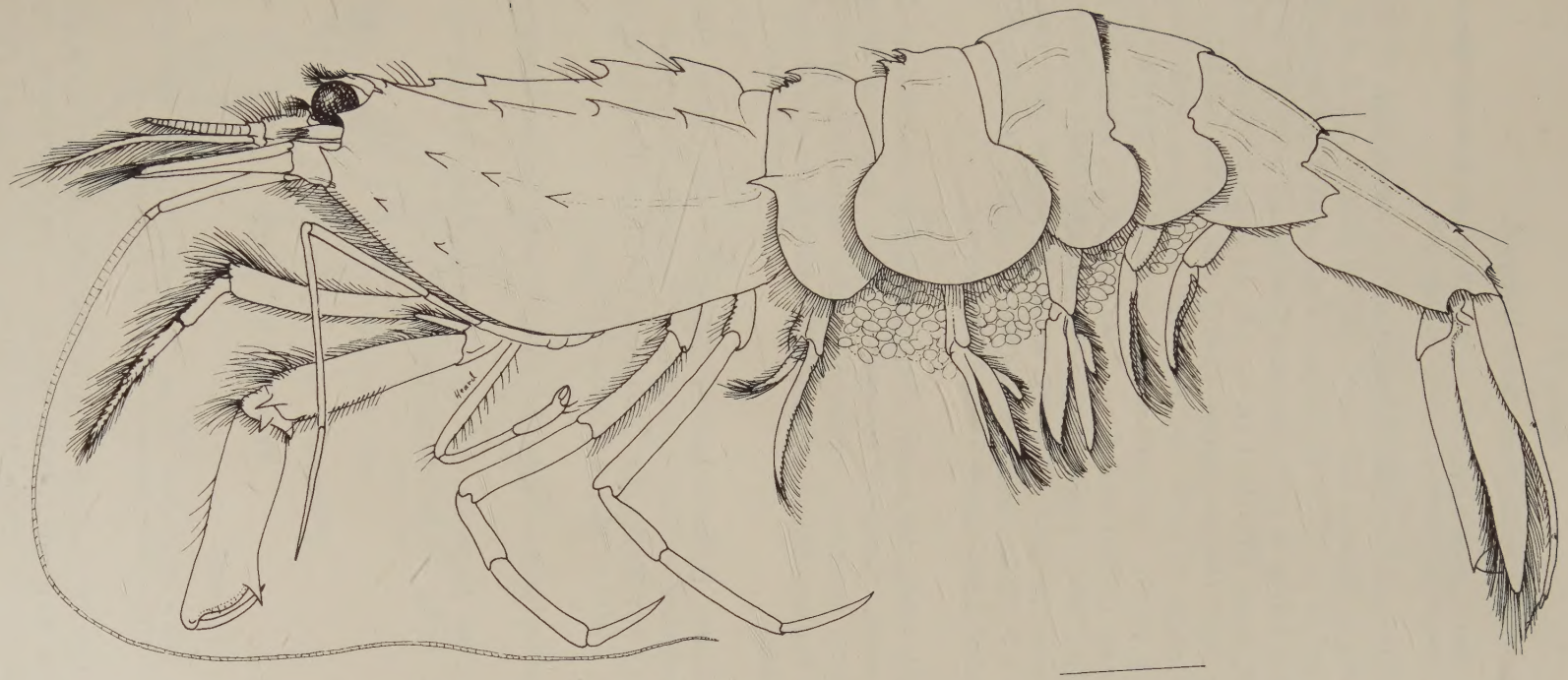

Figure 3. *Pontocaris caribbaea*, ovigerous female, CL 12.0, USNM 98647; whole animal, lateral view (scale equal to 5.0 mm).

Pontocaris caribbaea (Boone, 1927)

Figures 2f, 3

Aegeon caribbaeus Boone, 1927, pp. 125-131, fig. 28; Chace, 1956, p. 13 [in part].

Pontocaris caribbaeus: Thompson, 1962, p. 125 [? in part]; 1963, pp. 271-276 [in part]; Bullis and Thompson, 1965, p. 8 [in part]; Pequegnat, 1970, p. 111 [in part]; Pequegnat et al., 1971, p. 10 [in part].

Material examined: 1 ♀, 16.0; western Gulf of Mexico, off Galveston Bay; 27°48'N, 94°39'W; 366 m; 18 November 1951; *Oregon* Station 503; trawl; USNM 92859. — 1 ♂, 8.0; western Atlantic, north of Bahama Islands; 27°27'N, 78°58'W; 329 m; 2 February 1957; *Combat* Station 235; trawl; USNM 101313. — 1 ♀, 9.0; 1 ovig. ♀, 12.0; Straits of Florida; 23°38'N, 80°25'W; 457 m; 15 May 1979; *Bellows* Station 13; trawl; FIU 000111. — 2 ♀, 11.0, 13.0; Straits of Florida; 22°55'N, 79°27'W; 457 m; 15 July 1955; *Oregon* Station 1340; trawl; USNM 98646. — 3 ♀, 14.5-15.5; 1 ovig. ♀, 12.0; Straits of Florida; 22°55'N, 79°16'W; 439 m; 16 July 1955; *Oregon* Station 1341; trawl; USNM 98647. — 7 ♀, 11.0-17.0; Straits of Florida; 22°59'N, 79°17'W; 457 m; 16 July 1955; *Oregon* Station 1343; trawl; USNM 98648. — 2 ♀, 11.0, 12.0; Straits of Florida; 22°50'N, 79°08'W; 366-411 m; 16 July 1955; *Oregon* Station 1344; trawl; USNM 181352. — 2 ♀, 17.0, 19.0; Caribbean Sea, off Honduras; 16°39'N, 82°26'W; 457 m; 22 August 1957; *Oregon* Station 1871; trawl; USNM 181353. — 1 ♂, 13.0; Caribbean Sea, off Honduras; 16°50'N, 81°33'W; 311 m; 22 August 1957; *Oregon* Station 1881; trawl; USNM 101639.

Diagnosis: Rostrum broadly triangular, short, extending slightly beyond corneas, armed laterally with 2 pairs of strong spines. Carapace strongly sculpted; middorsal carina with 4 spines; branchial carinae converging anteriorly, continuing on lateral margins of rostrum, 4 spines on each; hepatic carinae with 3 spines; branchiostegal carinae with 2 spines posterior to branchiostegal spine; hepatic groove lacking.

Distribution: Western Atlantic, Bahama Islands (Bullis and Thompson, 1965) and Straits of Florida (Chace, 1956); northwestern Gulf of Mexico, off Galveston Bay (Chace, 1956); Caribbean Sea, off Honduras (Boone, 1927; Bullis and Thompson, 1965) (see Figure 16); from depths of 311 m (Bullis and Thompson, 1965) to 885 m (Boone, 1927).

Remarks: The specific epithet has been modified to agree with the feminine gender of the genus.

Pequegnat (1970), in her diagnosis of *P. caribbaea*, incorrectly reported five spines in the dorsal midline. See *Remarks* for the following species.

Pontocaris vicina n. sp.

Figures 2g, 4-7

Aegeon caribbaeus: Chace, 1956, p. 13 [in part].

Pontocaris caribbaeus: Thompson, 1962, p. 125 [? in part]; 1963, pp. 271-276, fig. 31D [in part]; Bullis and Thompson, 1965, p. 8 [in part]; Pequegnat, 1970, p. 111 [in part]; Pequegnat et al., 1971, p. 10 [in part].

Material examined: HOLOTYPE: 1 ovig. ♀, 19.0; Straits of Florida; 23°35'N, 80°22'W; 457 m; 15 May 1978; *Bellows* Station 8; trawl; USNM 189144. — PARATYPES: 1 ♀, 20.5; Straits of Florida; 23°35'N, 80°22'W; 457 m; 15 May 1978; *Bellows* Station 8; trawl; FIU 000112. — 1 ovig. ♀, 20.0; north central Gulf of Mexico, off Mississippi River Delta; 29°12'N, 88°21'W; 366 m; 19 September 1952; *Oregon* Station 639; trawl; USNM 93648. — 1 ♂, 16.0; 1 ♀, 18.0; Caribbean Sea,

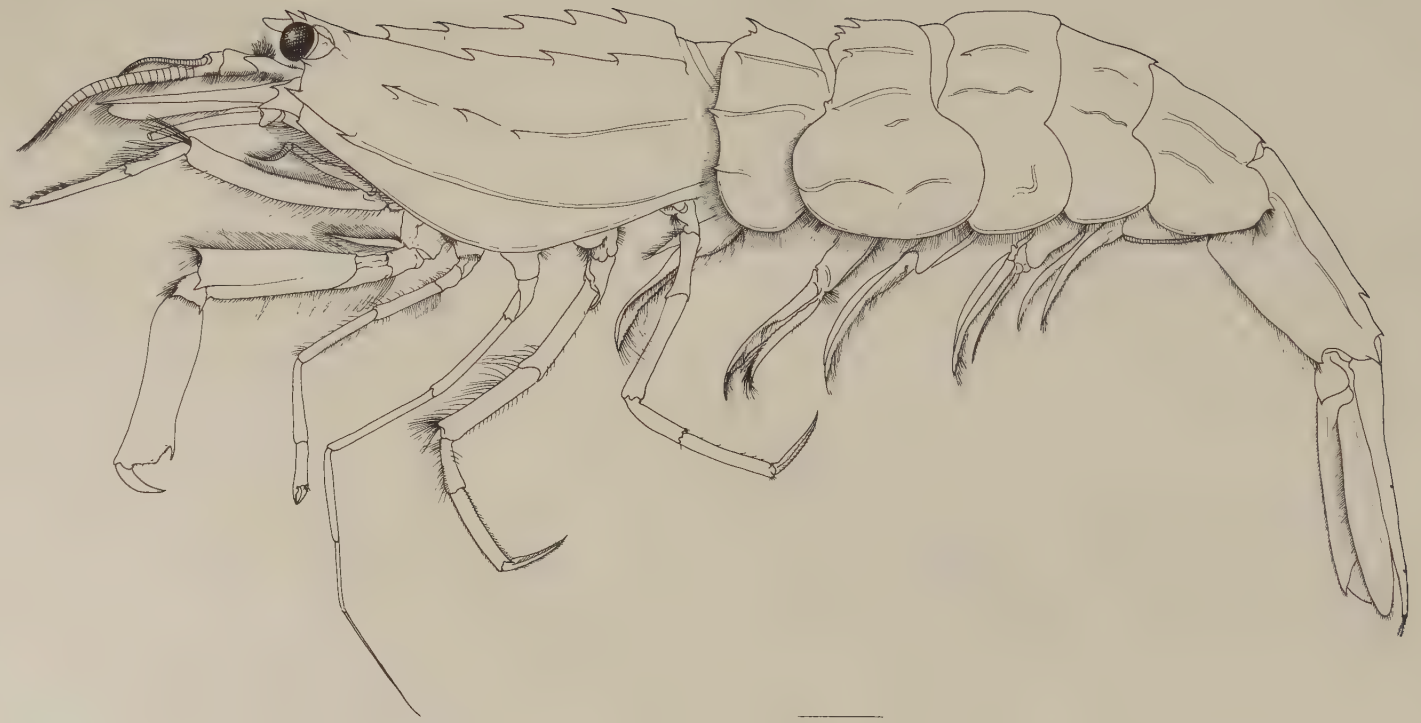

Figure 4. *Pontocaris vicina*, holotype, ovigerous female (eggs not shown), CL 19.0, USNM 189144; whole animal, lateral view (scale equal to 5.0 mm).

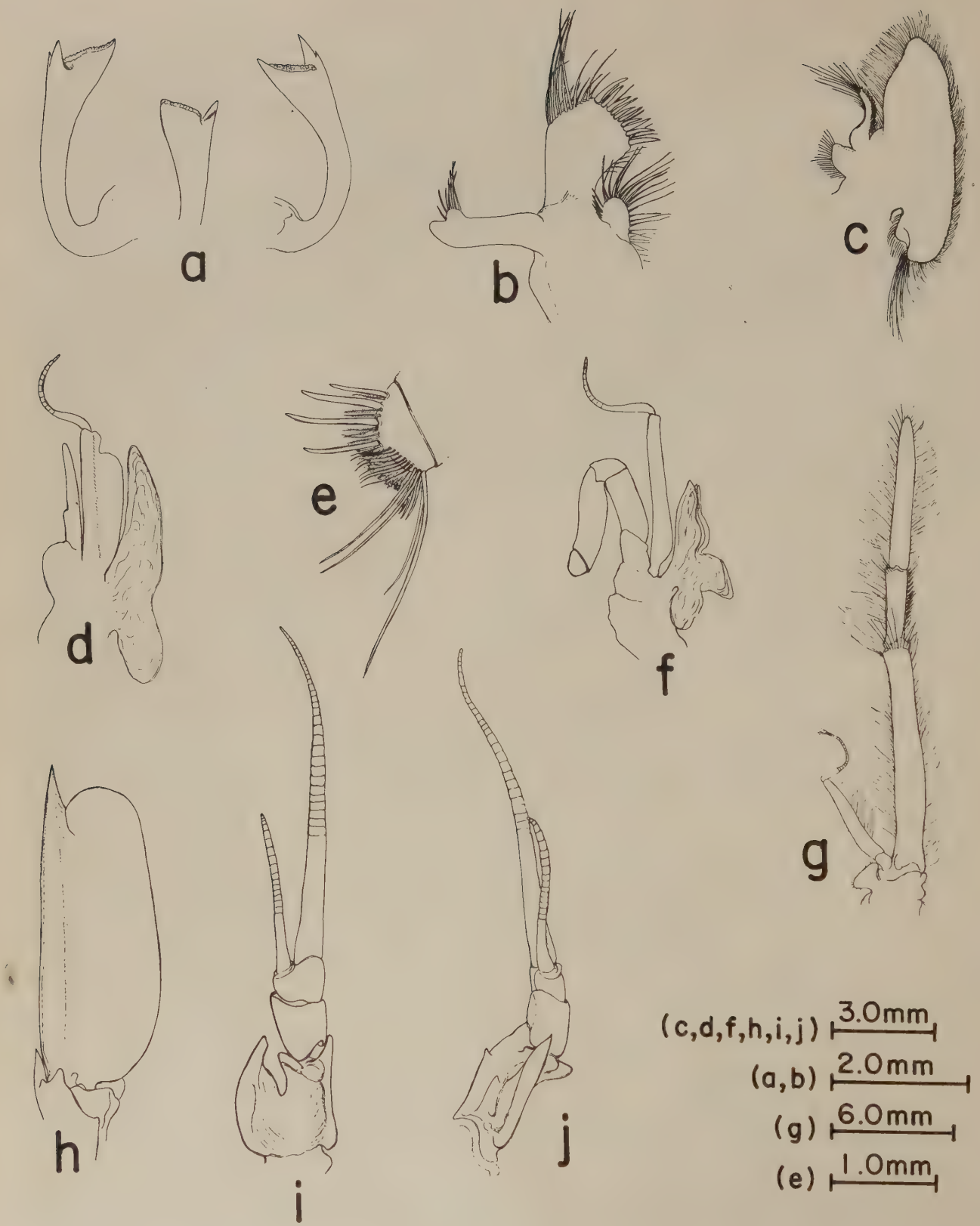

Figure 5. *Pontocaris vicina*, holotype, ovigerous female, CL 19.0, USNM 189144; a. 3 views of left mandible; b. left maxillula; c. left maxilla; d. left maxilliped 1; e. left maxilliped 2, distal tip of palp; f. left maxilliped 2; g. left maxilliped 3; h. left antennal scale; i. left antennule, dorsal view; j. same, lateral view.

off Honduras; 16°41'N, 82°20'W; 549 m; 22 August 1957; *Oregon* Station 1872; trawl; USNM 184050. — 1 ♀, 14.0; Caribbean Sea, off Honduras; 16°42'N, 82°40'W; 549 m; 16 September 1957; *Oregon* Station 1942; trawl; USNM 184052. — 1 ovig. ♀, 21.0; Caribbean Sea, off Honduras; 16°45'N, 82°25'W; 549 m; 17 September 1957; *Oregon* Station 1949; trawl; USNM 184053. — 1 ♀, 11.0; Caribbean Sea, off Honduras; 16°43'N, 82°38'W; 429-612 m; 12 July 1970; *Alaminos* Station 70A10-25; trawl; TAMU 2-6183. — 1 ovig. ♀, 17.5; Caribbean Sea, off Nicaragua; 13°39'N, 81°52'W; 502 m; 13 September 1957; *Oregon* Station 1923; trawl; USNM 184051.

Diagnosis: Rostrum narrowly triangular, extending beyond corneas nearly to distal margin of first antennular segment, armed laterally with 2 pairs of strong spines. Carapace strongly sculpted; middorsal carina with 5 spines; branchial carinae curved anteriorly, continuing on lateral margins of rostrum, 4 spines on each; hepatic carinae with 3 spines; branchiostegal carinae with 1 or 2 spines posterior to branchiostegal spines; hepatic groove lacking.

Description: Rostrum (Figure 2g) narrowly triangular, extending beyond corneas nearly to distal margin of first antennular segment; upper surface sulcate, apex slightly depressed; lateral margins raised, armed with 2 pairs of strong spines, larger, anteriormost pair situated about level of proximal margins of corneas, proximal pair immediately posterior, situated about midlength of rostrum. Carapace (Figures 2g, 4, 6j) broad, strongly sculpted; middorsal carina with 5 strong spines, last delimiting carina posteriorly; branchial carinae originating near posterior margin of carapace, curving anteriorly, continuing on lateral margins of rostrum, armed with 4 pairs of spines, anteriormost small; hepatic carinae in line with antennal spines, not extending that far forward, armed with 3 strong spines in hepatic region, continuing posteriorly nearly to margin of carapace; branchiostegal carinae beginning anteriorly with strong, projecting branchiostegal spine, continuing posteriorly nearly to margin of carapace, armed anteriorly with 1, sometimes 2, spines; anterolateral margins of carapace folded mesially, ending in small pterygostomian spine; posterolateral margins of carapace overlapped by pleura of first abdominal segment.

Stylocerite (Figure 5i, j) elongate, acute, extending slightly beyond distal margin of first article of antennular peduncle; antennular article 1 longer than 2, excavate to admit eye, inner distal dorsal margin setose, article 2 longer than 3; inner flagellum thick, setose in proximal 3/4, naked and tapering to point in distal fourth, extending by 1/3 length past antennal blade in female, longer in male, extending by over 1/2 length past antennal blade; outer flagellum thick, short in female, not reaching distal margin of antennal blade, 2 times thickness and 1/2 length of inner in male, extending well past distal margin of antennal blade. Antennal blade (Figure 5h) with margins subparallel, distal margin rounded; lateral margin of antennal scale straight, ending in robust distolateral spine exceeding antennal blade; distal segment of antennal peduncle falling considerably short of distal margin of antennal blade; flagellum tapering to slender tip.

Mouthparts as figured (Figure 5a-g).

Pereopod 1 (Figure 6a, b) strong, subchelate; dactyl slender; propodus cylindrical proximally, flaring laterally, becoming dorsoventrally compressed distally; subchelar spine simple; carpus short, less than 1/6 length of propodus, dorsal and ventral distolateral angles both produced into spines, ventral spine stronger; merus subequal to propodus, triangular in cross-section, dorsal and ventral distolateral angles both produced into subequal spines; ishium and basis short, combined lengths 1/2 that of merus; basis bearing short, setose exopod. Pereopod 2 (Figure 6c) slender, overreaching midlength of propodus of anteriorly extended pereopod 1, minutely chelate, internal margins of fingers concave, meeting only at tips; bifid tip of dactyl closing on

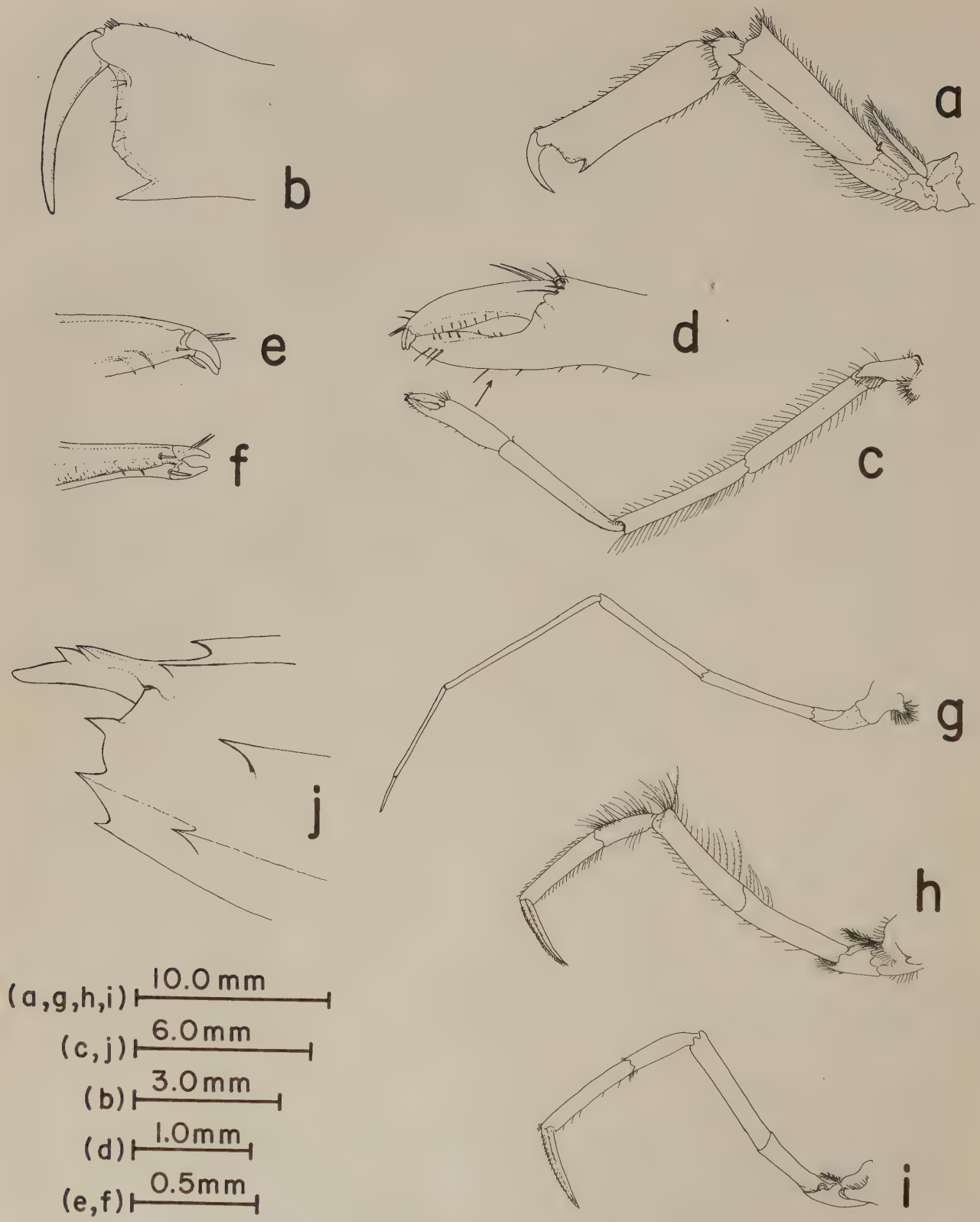

Figure 6. *Pontocaris vicina*, holotype, ovigerous female, CL 19.0, USNM 189144; a. left pereopod 1; b. same, dactyl; c. left pereopod 2; d. same, dactyl and propodus; e. same, lateral view of tip of dactyl; f. same, ventral view of tip of dactyl; g. left pereopod 3; h. left pereopod 4; i. left pereopod 5; j. lateral view of carapace.

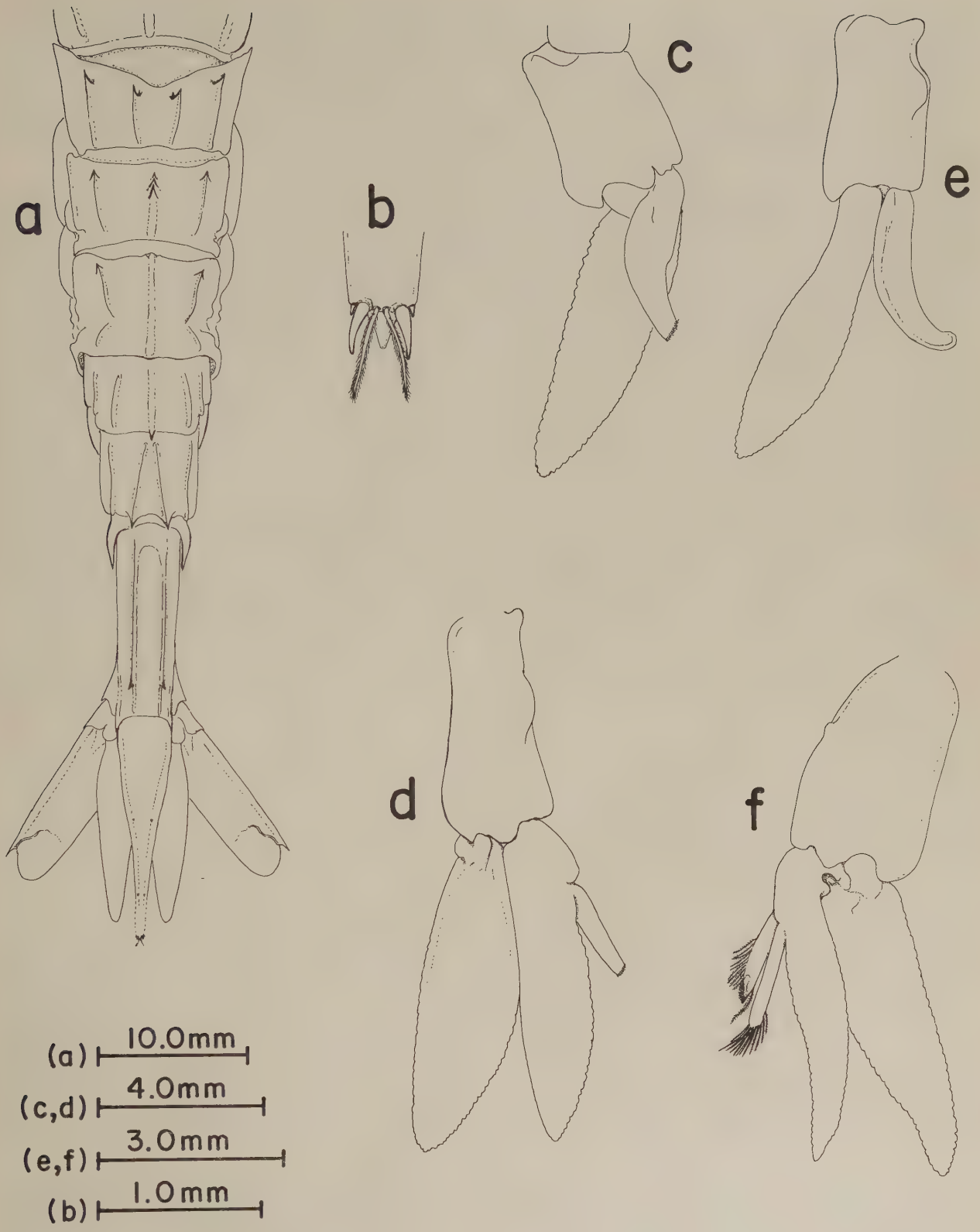

Figure 7. *Pontocaris vicina*, holotype, ovigerous female, CL 19.0, USNM 189144; a. dorsal view of abdomen and telson. Paratype, ovigerous female, CL 20.0, USNM 93648; b. ventral view of distal tip of telson. Holotype, ovigerous female, CL 19.0, USNM 189144; c. left pleopod 1; d. left pleopod 2. Paratype, male, CL 16.0, USNM 184050; e. left pleopod 1; f. right pleopod 2.

simple fixed finger (Figure 6d-f). Pereopod 3 (Figure 6g) long, slender, overreaching antennal scale by length of dactyl and propodus. Pereopods 4 and 5 (Figure 6h, i) subequal, similar, shorter and much stouter than pereopod 3; dactyls flat, broadened.

Eight branchiae (pleurobranchs) present; inferior apices directed anteriorly. Strong mediosternal spine between third or fourth pereopods, directed anteriorly.

Abdomen tapering to long, narrow sixth segment (Figures 4, 7a); pleura of segments 1-5 broadly rounded ventrally, fringed with setae, that of segment 6 subrectangular; posterolateral angle of segments 1-4 bluntly rounded, that of segment 5 developed into 1, sometimes 2, sharp spines. Median dorsal carina longitudinally bisecting abdomen, originating as 2 submedian carinae, each with single anterior spine on first segment, converging toward single carina with 3 spines on second segment, continuing as simple, unspined ridge on segment 3, bearing posteriorly directed spine distally on segment 4, bifurcating into 2 carinae on dorsal surface of segment 5, each with a terminal spine overlapping parallel carinae on segment 6, each bearing a single subterminal posteriorly directed spine. Branchial carinae continuing on abdomen with single spine on each of segments 1, 2 and 3, represented on segments 3 and 4 as obscure raised ridge, becoming better defined on segments 5 and 6, terminating in sharp spine overreaching telson. Hepatic carinae continuing on abdomen; tooth on anterolateral margin of segment 1 overlapping carapace, preceding distinct carinae on segments 1 and 2, becoming obscure on segments 3 and 4, again resolving into distinct ridges on segment 5, absent on segment 6. Branchiostegal carinae continuing on abdomen; tooth on anterolateral margin of segment 1 overlapping carapace, preceding distinct carinae on segments 1 and 2, continuing as obscure ridges on segments 3 and 4, absent on segments 5 and 6.

Pleopods as illustrated (Figure 7c-f). Appendices internae positioned basally on endopods of pleopods 2-5. Male with appendix masculina on pleopod 2.

Telson (Figure 7a, b) long, narrow, acute distally, bearing pair of strong apical spines mesial to minute spines on outer margin; minute dorsal spines on lateral margins at 2/5 and 4/5 length. Uropods long, narrow, setose; inner branch shorter than telson; outer branch shorter than inner branch, wider, margins subparallel, outer distal margin terminating in strong tooth.

Eggs minute, numerous.

Type-locality: Cay Sal Bank, Straits of Florida, 23°35'N, 80°22'W, 457 m.

Distribution: Western Atlantic, Bahama Islands (?) (Thompson, 1962); north central Gulf of Mexico, off Mississippi River Delta (Chace, 1956); Straits of Florida; Caribbean Sea, off Honduras and Nicaragua (Bullis and Thompson, 1965) (see Figure 16); from depths of 366 m (Chace, 1956) to 549 m (Bullis and Thompson, 1965). One specimen (TAMU 2-6183) was taken in a trawl haul which sampled from 429 m to 612 m, but the exact depth at which it was captured is uncertain.

Etymology: From the Latin, *vicina*, meaning neighboring, in reference to its sympatry with the preceding species.

Remarks: This species has been previously confused with *P. caribbaea*, a morphologically similar species with a nearly identical distribution. They are, however, easily separated by the presence of an additional spine in the dorsal midline of the carapace, an additional spine dorsally on the

second abdominal segment, two spines on the first abdominal segment overlapping the distolateral margin of the carapace rather than one, and a more elongate rostrum in *Pontocaris vicina*. The two species must have similar but not identical ecological requirements; although taken in successive trawl hauls, they were never taken together in the same haul.

A further difference is evident in the size structure of populations of the two species. Although the size ranges are similar, 9.0-19.0 mm CL in *Pontocaris caribbaea* and 14.0-21.0 mm in *P. vicina*, ovigerous females are much larger in *P. vicina*. The three ovigerous females of *P. caribbaea* are all 12.0 mm, while those of *Pontocaris vicina* range from 17.5 to 21.0 mm.

Thompson (1963), in an unpublished dissertation, noted two distinct color patterns from material that he considered to be a single species. Almost certainly, one represented this species, while the other represented *P. caribbaea*, although it is impossible to say which color pattern goes with which species.

The specimens reported by Thompson (1962) from the Bahama Islands are no longer at the Pascagoula Laboratory nor can they be traced. Until they are located their identity must remain uncertain.

Pontophilus brevirostris Smith, 1881

Figures 2a, 8

Pontophilus brevirostris Smith, 1881, pp. 435, 436; 1882, pp. 35, 36, pl. 7, figs. 1, 1a, b; 1887, p. 653; Chace, 1956, p. 14; Thompson, 1962, p. 125; 1963, pp. 262-268, figs. 31B, 32; Pequegnat, 1970, p. 113; Pequegnat et al., 1971, p. 10; Williams, 1974, pp. 14, 40, fig. 37; Williams and Wigley, 1977, p. 8; Young, 1978, p. 175; Wenner and Boesch, 1979, p. 110.

Material examined: 1 ♀, 4.5; northeast Gulf of Mexico, off Cape San Blas; 29°34'N, 86°35'W; 205 m; 16 October 1971; *Tursiops* Station T-7127-09; trawl; TAMU 2-2271. — 1 ♀, 4.5; northeast Gulf of Mexico, off Cape San Blas; 28°50'N, 85°37'W; 179 m; 30 October 1977; *Java Seal* Station 2427; trawl; MESC 6179-2388. — 3 ♀, 3.8-4.0; northeast Gulf of Mexico, off Cape San Blas; 28°43'N, 85°29'W; 161 m; 15 March 1885; *Albatross* Station 2403; trawl; USNM 23674. — 7 ♀, 4.8-7.3; southeast Gulf of Mexico, off Florida Keys; 24°20'N, 83°20'W; 347 m; 13 April 1954; *Oregon* Station 1005; trawl; USNM 97436. — 2 ♂, 3.6, 3.7; 1 ♀, 4.8; 3 ovig. ♀, 5.0-5.0; 2 juv., 2.7, 3.2; Straits of Florida, off Florida Keys; 24°18'N, 81°54'W; 232 m; 19 February 1902; *Fish Hawk* Station 7283; trawl; USNM 57248. — 1 ♂, 4.8; 1 ♀, 5.4; 3 ovig. ♀, 5.2-5.6; Straits of Florida, off Florida Keys; 24°21'N, 81°52'W; 199 m; 19 February 1902; *Fish Hawk* Station 7282; trawl; USNM 57247. — 1 ♀, 8.0; 1 ovig. ♀, 7.1; western Atlantic, off Martha's Vineyard; 183 m; 13 September 1880; *Fish Hawk* Station 873; SYNTYPES; USNM 35390.

Diagnosis: Rostrum short, not reaching to end of cornea; armed laterally with pair of acute spines; tip blunt, rounded. Three strong spines preceded anteriorly by blunt projection on dorsal midline of carapace; 2 or 3 spines on branchial carina; 1 on hepatic surface. Exopod on pereopod 1.

Distribution: Gulf of Maine south along the east coast of the United States to the southern tip of Florida (Smith, 1887; Williams and Wigley, 1977); Bahama Islands (Thompson, 1962); eastern Gulf of Mexico from off Cape San Blas to near Dry Tortugas (Chace, 1956) (see Figure 17); from depths of 7-426 m (Smith, 1882; 1887).

Remarks: The bathymetric range of *P. brevirostris* is placed by most authors at outer continental

Figure 8. *Pontophilus brevirostris*, ovigerous female, CL 5.6, USNM 57247; whole animal, lateral view (scale equal to 5.0 mm).

shelf and upper slope depths, irrespective of the locality sampled (Smith, 1881; 1882; 1887, 115-426 m with one exception discussed below; Thompson, 1962, 278 m; Wenner and Boesch, 1979, 89-312 m; material examined, 161-347 m). Williams and Wigley (1977), however, based on data in the National Marine Fishery Service Woods Hole collection, report the range as 25-350 m. Furthermore, Smith (1887) reports a single specimen, from off Cape Hatteras, captured at 7 m. This eurybathic species is apparently most abundant beneath the 100 m isobath, but is occasionally found in shallower water. Thompson (1963) points out that ovigerous females seem to prefer shelf depths.

Bottom temperatures from which this species has been taken range from 4.9°C (Williams and Wigley, 1977) to 17.2°C (Smith, 1887).

Pontophilus gorei Dardeau, 1980

Figures 2d, 9

Pontophilus gorei Dardeau, 1980, pp. 563-572, figs. 1-4.

Material examined: HOURGLASS STATION C: 1 ♀, 1.6; 3 January 1966; dredge; FSBC I 23809. — 1 ♂, 1.5; 1 August 1966; trawl; FSBC I 23810. — 1 damaged ovig. ♀; 20 May 1967; trawl; FSBC I 23811. — 1 ♂, 1.5; 2 June 1967; trawl; FSBC I 23812. — 1 ovig. ♀, 2.1; 2 June 1967; trawl; PARATYPE; FSBC I 21454. — 2 ♀, 1.7, 1.9; 5 October 1967; dredge; FSBC I 23813. — HOURGLASS STATION D: 1 ♀, 2.0; 1 ovig. ♀, 2.0; 11 July 1966; trawl; FSBC I 23814. — 1 ♂, 1.9; 1 September 1966; trawl; ALLOTYPE; USNM 172418. — 1 ♂, 1.9; 1 September 1966; trawl; FSBC I 23815. — 1 ♂, 1.9; 2 ovig. ♀, 2.1, 2.3; 1 ♀ (with bopyrid), 2.2; 9 September 1966; trawl; FSBC I 23816. — 1 ♂, 1.9; 6 February 1967; trawl; PARATYPE; IRCZS 89:3474. — 1 ♂, 1.9; 12 May 1967; trawl; FSBC I 23817. — 1 ♀, 2.0; 12 May 1967; dredge; FSBC I 23818. — 1 ♀, 1.9; 21 May 1967; dredge; FSBC I 23819. — 1 ♂, 1.8; 2 July 1967; dredge; FSBC I 23820. — 1 ♀, 1.8; 1 ovig. ♀, 2.1; 12 July 1967; dredge; FSBC I 23821. — 1 ♂, 1.7; 12 September 1967; dredge; FSBC I 23822. — 2 ♀, 1.9, 1.9; 6 October 1967; dredge; FSBC I 23823. — 1 ♂, 1.9; 3 November 1967; trawl; FSBC I 23824. — HOURGLASS STATION E: 1 ovig. ♀, 2.0; 7 April 1966; trawl; FSBC I 23825. — 1 ♂, 1.8; 1 ovig. ♀, 2.1; 2 August 1966; trawl; PARATYPES; RMNH D31979. — 4 ♂, 1.5-2.2; 5 ♀, 1.7-2.1; 3 ovig. ♀, 2.0 (2 damaged); 2 juv., 1.4, 1.5; 2 August 1966; trawl; FSBC I 23826. — 7 ♂, 1.5-2.1 (latter with bopyrid; 1 damaged); 7 ♀, 1.8-2.5 (1 with bopyrid); 1 juv., 1.5; 2 August 1966; dredge; FSBC I 23827. — 1 ♂, 1.8; 2 ♀, 1.7, 1.8; 3 juv., 0.6-1.2; 2 December 1966; dredge; PARATYPES; USNM 172419. — 1 ♂, 1.8; 1 ♀, 1.7; 1 juv., 1.2; 3 March 1967; dredge; FSBC I 23828. — 1 ♂, 1.4; 1 ♀, 1.9; 12 May 1967; trawl; FSBC I 23829. — 1 juv., 1.4; 12 May 1967; dredge; FSBC I 23830. — 1 ♂, 1.9; 1 ♀, 1.9; 2 August 1967; dredge; FSBC I 23831. — 1 juv., 1.4; 6 October 1967; dredge; FSBC I 23832. — HOURGLASS STATION K: 1 ovig. ♀, 2.0; 7 April 1967; dredge; PARATYPE; IRCZS 89:3475. — 1 ovig. ♀, 2.2; 6 June 1967; dredge; PARATYPE; IRCZS 89:3476. — HOURGLASS STATION L: 1 ovig. ♀, 2.2; 6 July 1966; dredge; FSBC I 23833. — 1 ovig. ♀, 2.5; 6 August 1966; trawl; HOLOTYPE; USNM 172417. — 1 ♀, 2.1; 6 August 1966; dredge; FSBC I 23834. — 1 ♂, 1.8; 1 ovig. ♀, 1.8; 5 September 1966; dredge; FSBC I 23835. — 1 juv., 1.3; 13 January 1967; trawl; FSBC I 23836. — 1 ♀, 2.0; 16 February 1967; trawl; FSBC I 23837. — 1 ♀, 2.2; 16 February 1967; dredge; FSBC I 23838. — 1 ♀, 2.3; 16 May 1967; dredge; FSBC I 23839. — 1 ♀, 1.8; 7 June 1967; dredge; FSBC I 23840. — 4 ♂, 1.5-1.9 (1 damaged); 8 August 1967; trawl; FSBC I 23841. — 2 ♀, 2.0 (1 damaged); 1 ovig. ♀, 2.0; 1 juv., 1.0; 8 August 1967; dredge; FSBC I 23842. — 1 ♀, 2.2; 5 September 1967; dredge; FSBC I 23843. — 1 ♂, 1.8; 12 October 1967; trawl; PARATYPE; FSBC I 21455. — 1 ♀, 2.0; 1 juv., 1.4; 12 October 1967; dredge; FSBC I 23844. — 1 ♂, 1.6; 1 ♀, 1.8; 15 November 1967; trawl; FSBC I 23845. — 1 ♀, 1.8;

15 November 1967; dredge; FSBC I 23846. — HOURGLASS STATION M: 1 damaged specimen; 14 January 1966; dredge; FSBC I 23847. — 1 ♀, 1.9; 12 April 1966; dredge; FSBC I 23848. — 2 ♀, 2.1, 2.2; 5 September 1966; dredge; FSBC I 23849. — 1 ovig. ♀, 2.1; 13 October 1966; trawl; PARATYPE; TAMU 2-5944. — 2 ♀, 1.7, 1.7; 9 March 1967; dredge; FSBC I 23850. — 1 ♂, 1.6; 8 April 1967; trawl; FSBC I 23851. — 1 ♂, 1.9; 2 ♀, 1.8, 1.9; 6 July 1967; dredge; FSBC I 23852. — 1 ♂, 1.8; 8 August 1967; trawl; PARATYPE; TAMU 2-5943. — OTHER MATERIAL: 2 ♂, 2.0, 2.0; 1 juv., 1.4; off coast of northwest Florida; 27°55'N, 83°39'W; 31 m; box core; 16 June 1974; MESC 6179-2389. — 1 ♀, 2.2; 1 ovig. ♀, 1.8; off coast of northwest Florida; 28°24'N, 84°21'W; 42 m; box core; 18 June 1974; MESC 6179-2390. — 1 juv., 1.4; off coast of northwest Florida; 28°25'N, 85°15'W; 182 m; 29 September 1977; trawl; PARATYPE; MESC 6179-1510. — 1 ♂, 1.9; off east coast of Texas; 27°37'N, 96°33'W; 59 m; 5 June 1971; from stomach of *Prionotus rubio*; PARATYPE; TAMU 2-5942. — 1 ♂, 1.9; western Atlantic, off Georgia; 30°55'N, 81°18'W; 9 m; 9 September 1973; small biological trawl; PARATYPE; USNM 172420. — 1 ♀ (with bopyrid), 2.3; western Atlantic, off central Florida; 27°28'N, 79°57'W; 120 m; 9 August 1974; 10 ft otter trawl; IRCZS 89:3861.

Diagnosis: Rostrum short, extending slightly beyond cornea, armed midlaterally with pair of blunt spines; tip spatulate, with expanded, truncate apex. Carapace smooth, with single, strong dorsomedial spine behind rostrum; hepatic spines lacking. Exopod lacking on pereopod 1; merus with strong spine midway on flexor margin; subchelar spine simple.

Distribution: Western Atlantic off central eastern Georgia and central eastern Florida; Gulf of Mexico, off central western Florida and southern Texas (Dardeau, 1980) (see Figure 16). The western Atlantic specimen from Georgia was taken from 9 m but, despite extensive sampling in shallow water, no Gulf specimens have been taken any shallower than 31 m. The greatest depths from which specimens have been taken are 120 m in the Atlantic and 182 m in the Gulf of Mexico.

Remarks: *Pontophilus gorei* differs from all other *Pontophilus* in the Gulf of Mexico by lacking an exopod on the first pereopod. This character, according to recent European workers (Zariquiey Alvarez, 1968; Lagardère, 1971), would place this species in the genus *Philocheras*. *Pontophilus gorei*, however, is typical of *Pontophilus* in nearly every other respect; the stylocerite is acute, the second pereopod does not reach the distal margin of the merus of the first pereopod, the endopods of the pleopods are unsegmented, and, most importantly, a well-developed appendix interna is present. Accordingly, as Kemp (1911) proposed, *Philocheras* should be considered a junior synonym of *Pontophilus*. However, if the exacting criteria used to define the genera proposed by Zarenkov (1965) and Kuris and Carlton (1977) are applied to *Pontophilus*, *Philocheras* may be resurrected and several new genera described.

Morphological variation: The length of the pleopodal endopod relative to that of the exopod is a character used by Zariquiey Alvarez (1968) and Lagardère (1971) to separate *Pontophilus* from *Philocheras*. Each author states in his key to eastern Atlantic crangonids that *Philocheras* has the endopod of the last four pleopods short, not reaching to the midlength of the exopod, while *Pontophilus* has the endopod subequal to the exopod. Kemp (1916) attempted to separate the *Pontophilus/Philocheras* complex into five groups based on the development of the endopod on the last four pairs of pleopods. In *P. gorei*, however, the relative lengths vary with sex (see general discussion of secondary sexual characters) and stage of development. Relative length of the endopod varies little in ovigerous females from 1.8 to 2.2 mm carapace length. In non-ovigerous females (recognizable at 1.5 mm CL), the relative length increases as specimens increase in size up to 1.8 mm CL, whereupon the relative length remains constant. Between 1.5 and 1.7 mm CL, the appendices internae may be missing on the posterior pairs of pleopods. The appendix masculina

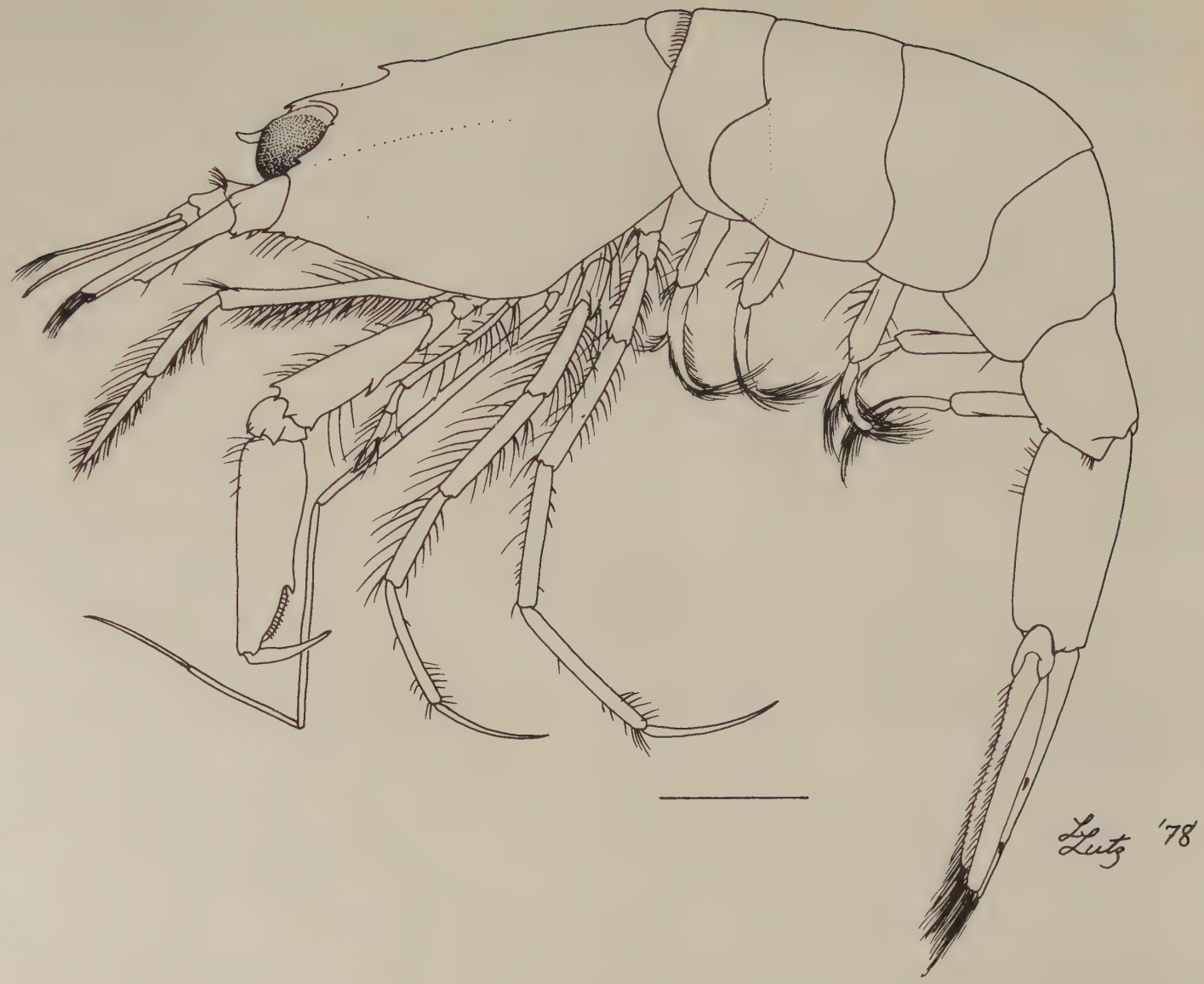

Figure 9. *Pontophilus gorei*, paratype, ovigerous female (eggs not shown), CL 2.1, RMNH D31979; whole animal, lateral view (scale equal to 1.0 mm) (after Dardeau, 1980).

of the male is present at 1.5 mm CL, although it may be somewhat reduced. The relative lengths of male endopods show the same progressive increase as in females but continue to increase in specimens up to 2.2 mm CL. Juveniles, less than 1.4 mm CL, may or may not possess an appendix interna.

Examination of selected features of carapace and appendage morphology (length of rostrum relative to cornea, shape of endopod of first pleopod, length of endopod relative to exopod of last four pleopods, development of appendices internae on last four pleopods, position of appendix interna of fifth pleopod, shape and length of stylocerite relative to distal margin of basal segment of antennular peduncle, development and position of suborbital spine, development and position of antennal spine, development and position of minute spine located posteroventral to pterygostomian spine, distal spination of carpus of first pereopod, distal spination of merus of first pereopod and length of second pereopod relative to that of first) of each of the 112 Hourglass specimens revealed little significant variation that could not be attributed to sex or stage of development. Comparison of western Atlantic material with Gulf specimens likewise did not disclose any differences.

Abundance, seasonality and size structure of the population: Occurrence of 112 specimens of *Pontophilus gorei* in Hourglass collections made from December, 1965, through November, 1967, was analyzed for seasonal size structure and bathymetric distribution. Although the sample size was small, some trends were recognizable.

Population abundance was lowest at Stations C and K and became progressively greater at the deeper stations (Table 3, Figure 10). No specimens were taken from less than 37 m within the Hourglass study area. The 37 m isobath marks a change from terrigenous quartz-sand sediments to biogenic shell and algal sand sediments on the central west coast of Florida (Gould and Stewart, 1955; Cobb et al., 1973). *Pontophilus gorei*, like most other crangonids, is probably a benthic burrower and thus is likely to be influenced by major substrate discontinuities.

TABLE 3. MONTHLY CATCH OF *PONTOPHILUS GOREI* AT HOURGLASS STATIONS, TRAWL AND DREDGE SAMPLES COMBINED.

Pontophilus gorei																													
STA	1965					1966													1967										TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A																															
B_1																															
B_2																															
C_1						1								1											2				2		6
C_2																								1							1
D_1															2						1			2		1			2	1	9
D_2												2			4									1		2		1			10
E									1					31				6				3		3			2		1		47
I																															
J																															
K																							1		1						2
L												1		2	2				1		2			1	1		8	1	3	3	25
M						1			1						2	1						2	1			3	1				12
TOT						2			2			3		34	10	1		6	1		3	5	2	8	4	6	11	2	8	4	112

Subscripts 1, 2 and sp. represent regular (night), post (day) and supplementary (45 ft trawl) cruises.

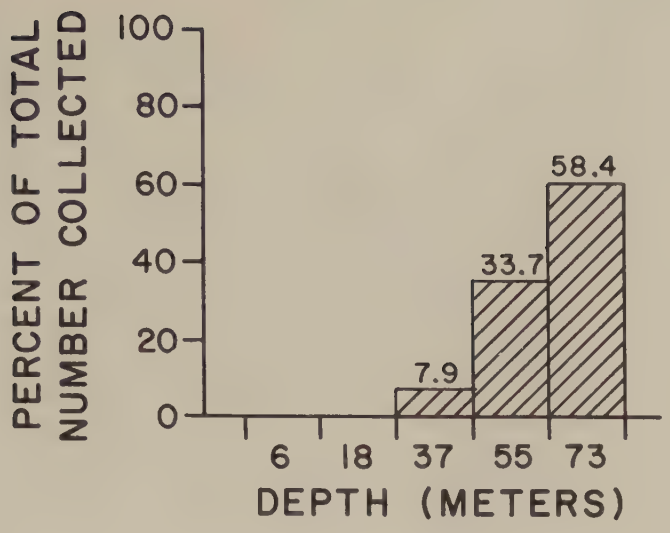

Figure 10. Relative abundance of *Pontophilus gorei* by depth.

Although there seemed to be no relationship between the seasons and the depths at which specimens were taken, population abundance varied seasonally throughout the overall study area. Occurrence at individual stations was intermittent throughout the 28 months (Table 3). With the exception of an uncharacteristically large catch in August, 1966, at Station E (31 specimens, 27.5% of total), most catches were small, comprising 1 to 6 individuals. When abundance data from all stations and respective months were combined, results indicated *P. gorei* was most abundant during summer months, June through October (Figure 11). Populations declined throughout the fall to a low in the winter months of January and February and then began to recover in the spring. These data, however, are indeterminate. The increasing abundance with depth (Figure 10) and the fact that *P. gorei* has been taken as deep as 182 m suggest that only the outer fringe of the species' bathymetric distribution was sampled, resulting in intermittent catches and ambiguous results. Although females were more abundant than males in the study area, neither a tendency toward aggregation nor segregation by sex or size was evident, further substantiating the sedentary, benthic nature of this species.

Length-frequency data (Figure 12) suffer most from the small sample size. The presence of ovigerous females from April to October and of juveniles in May, August, October, December, January, and March is indicative of a long breeding season. The discontinuous, low level of recruitment may reflect year-round spawning in a deep-water population or, more likely, inadequate sampling of the Hourglass population. The extended breeding season and small sample size likewise obscure modal progressions.

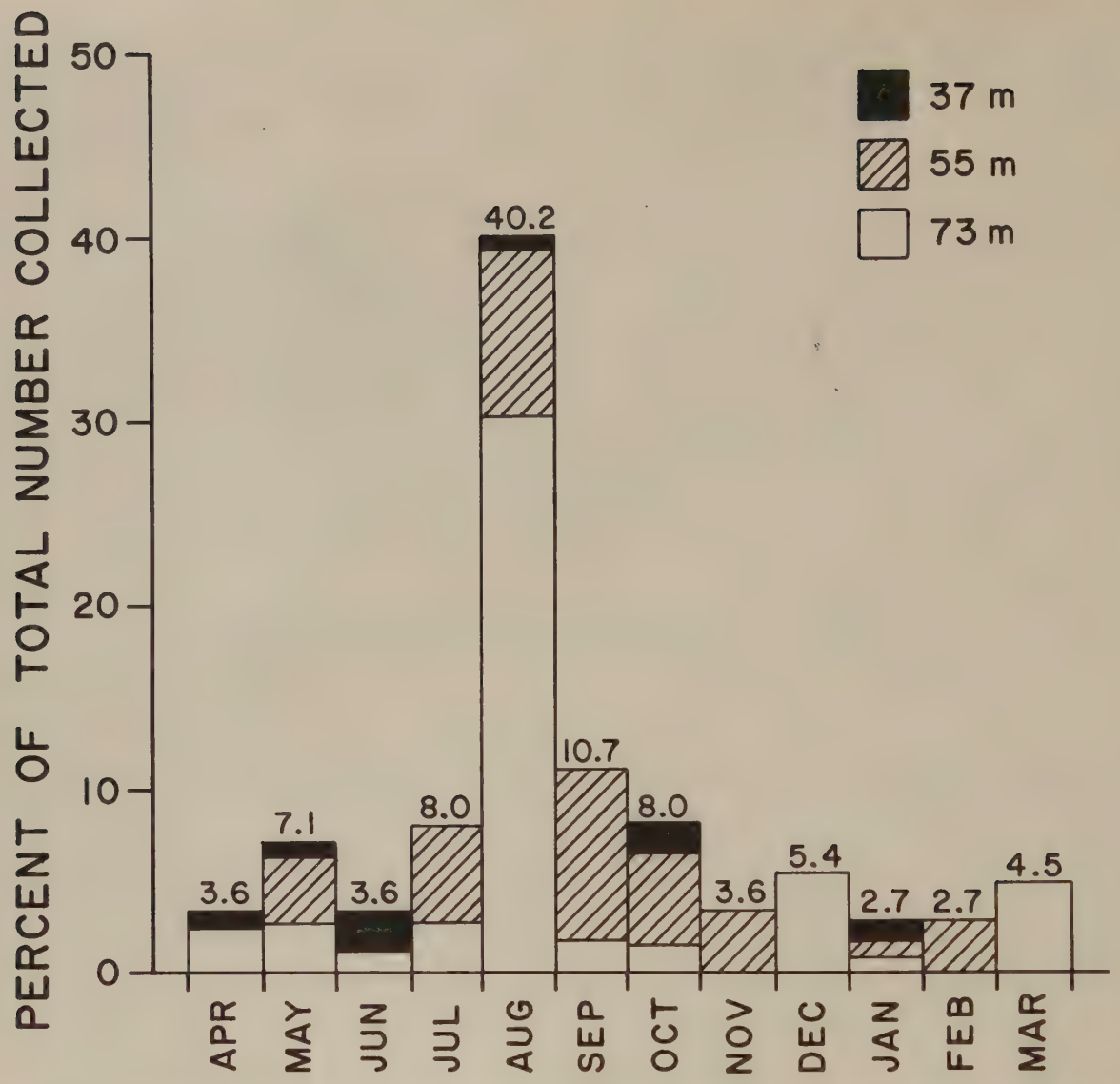

Figure 11. Relative abundance of *Pontophilus gorei* by month (stations of similar depth and monthly catches from December 1965 through November 1967 combined).

Pontophilus gracilis Smith, 1882

Figures 2c, 13

Pontophilus gracilis Smith, 1882, pp. 36-38, pl. 7, figs. 2, 2a-c, 3, 3a; 1887, p. 654, pl. 11, figs. 1, 1a, 2; Wood-Mason and Alcock, 1891, p. 361; Faxon, 1896, p. 157; Alcock, 1901, p. 115; Stebbing, 1905, pp. 94-97, pl. 25; Barnard, 1950, pp. 806-808, fig. 153a-h; Thompson, 1963, pp. 268-271; Pequegnat, 1970, pp. 113-115; Pequegnat et al., 1971, p. 10; Crosnier and Forest, 1973, pp. 242-245, fig. 79e-f.

Not *Pontophilus gracilis* Bate, 1888, p. 487, pl. 137, fig. 1 [homonym, in part; = *P. challengeri* Ortmann, 1893].

Not *Pontophilus gracilis*: Rathbun, 1906, p. 910.

Pontophilus occidentalis var. *indica* DeMan, 1918, pp. 161, 162; 1920, pp. 264-270, pl. 20, figs. 63, 63a, pl. 21, fig. 63b-v; Kensley, 1968, pp. 319-321, figs. 18, 19.

Pontophilus indicus: Calman, 1939, pp. 219, 220; Richardson and Yaldwyn, 1958, p. 41, fig. 46.

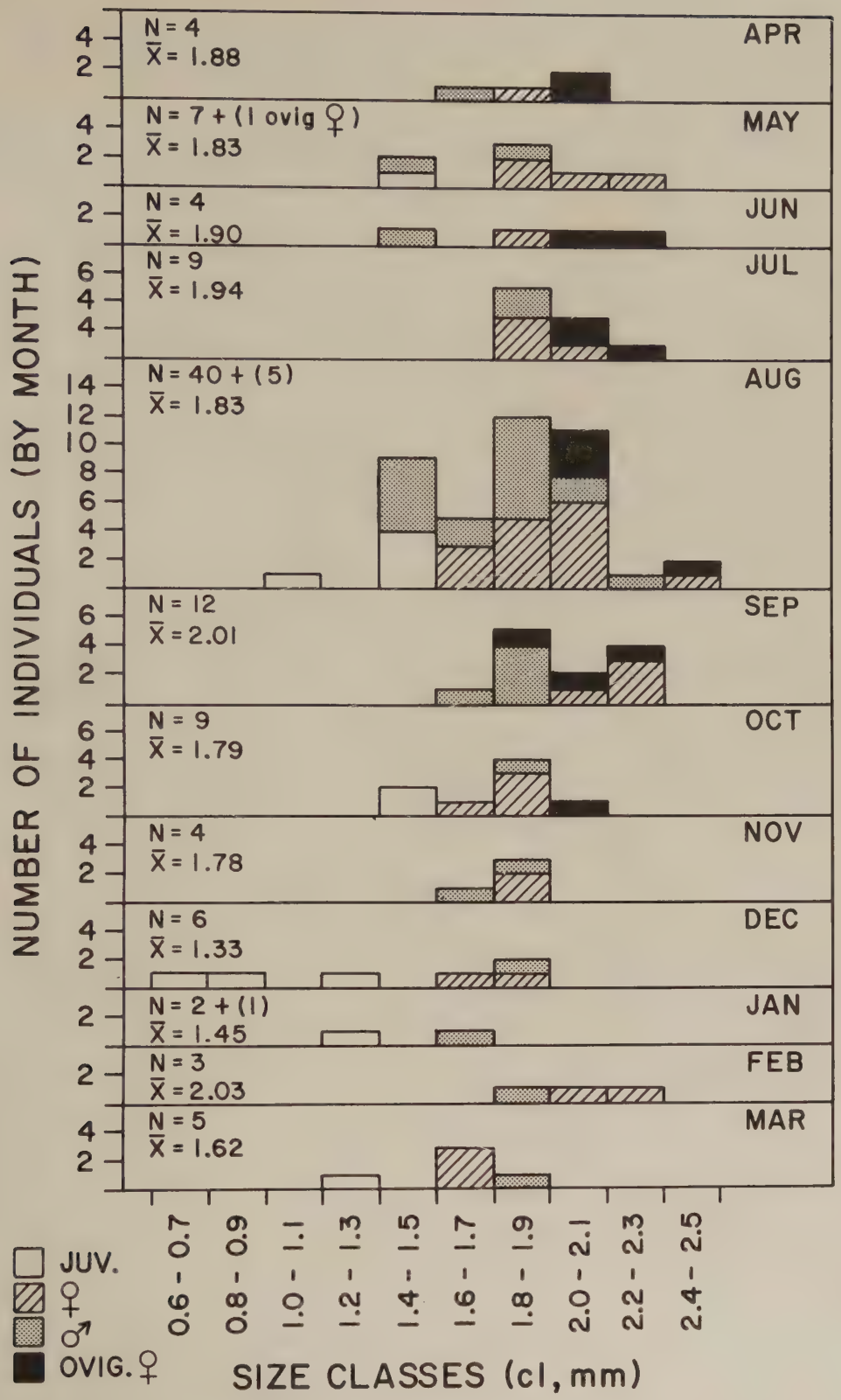

Figure 12. Size structure of population of *Pontophilus gorei* at Hourglass stations. Monthly catches from December 1965 through November 1967 combined. Numbers in parentheses represent damaged, unmeasurable specimens; $\bar{x}$ represents mean carapace length of specimens collected during month indicated.

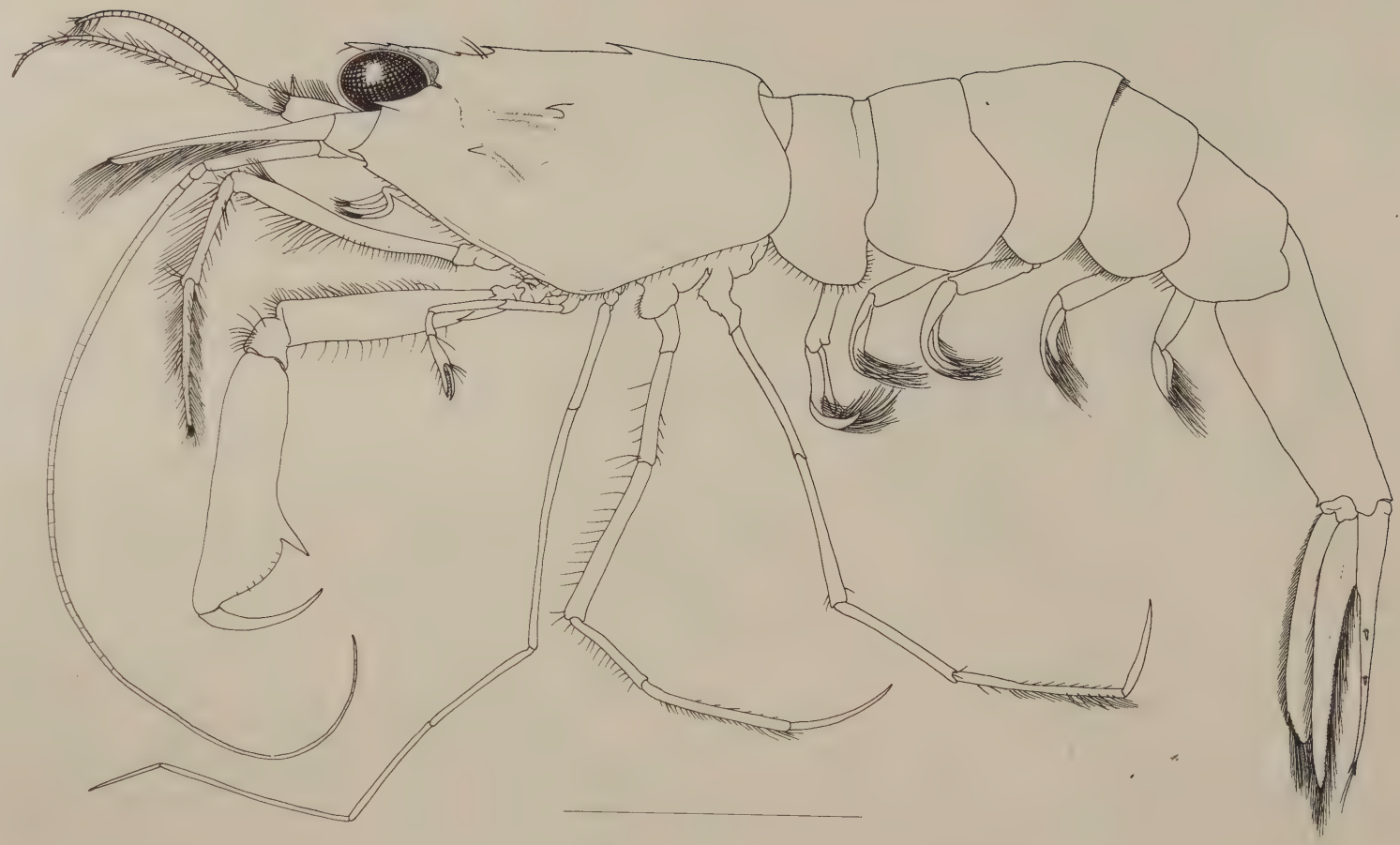

Figure 13. *Pontophilus gracilis*, female, CL 5.5, TAMU 2-2284; whole animal, lateral view (scale equal to 5.0 mm).

Material examined: 1 ♂, 4.0; 1 ♀, 5.5; northwest Gulf of Mexico, off Galveston Bay; 27°45'N, 95°16'W; 438 m; 19 November 1968; *Alaminos* Station 68A13-18; dredge; TAMU 2-2284. — 2 ♂, 5.0, 5.4; 1 ♀, 6.4; 2 ovig. ♀, 5.1, 5.2; northeast Gulf of Mexico, off Mobile Bay; 29°03'N, 88°16'W; 592 m; 11 February 1885; *Albatross* Station 2376; trawl; USNM 23649. — 1 ♀, 7.0; northeast Gulf of Mexico, off Pensacola Bay; 28°48'N, 87°27'W; 1324 m; 13 March 1885; *Albatross* Station 2392; trawl; USNM 23650. — 1 ♂, 4.8; 1 ♀, 7.6; western Atlantic, off Cape Florida; 25°40'N, 80°00'W; 353 m; 9 April 1886; *Albatross* Station 2644; dredge; USNM 11465.

Diagnosis: Rostrum slender, acute, reaching nearly to end of cornea, usually armed laterally with 2 pairs of spines (posterior pair sometimes absent or indistinct). Middorsal surface of carapace with 2 strong spines, 1 gastric, 1 cardiac, and very small denticle (sometimes reduced to granule or absent) anterior to gastric spine; branchial carina with 1 (rarely 2) spine(s); hepatic surface with 1 spine. Exopod on pereopod 1.

Distribution: Atlantic Ocean, east coast of the United States between 39°57'N and 25°40'N (Smith, 1887), throughout Gulf of Mexico (Faxon, 1896; Pequegnat, 1970; Crosnier and Forest, 1973), Caribbean, Windward Islands (Faxon, 1896) and off the west coast of Africa, between 22°49'N and 25°39'N and 4°00'S and 11°57'S (Crosnier and Forest, 1973), as well as the Cape region (Stebbing, 1905; Barnard, 1950; Kensley, 1968); Indian Ocean, off Zanzibar, the Gulf of Aden and near the Maldive Islands (Calman, 1939), the Bay of Bengal (Wood-Mason and Alcock, 1891), and near Indonesia (DeMan, 1920); Pacific Ocean, off New Zealand (Richardson and Yaldwyn, 1958) (see Figure 18). Depths of capture range from 370 m (Barnard, 1950) to 3,440 m (Kensley, 1968) in the Atlantic, and between 485 m (Alcock, 1901) and 2,926 m (Calman, 1939) in the Indo-West Pacific.

Remarks: Thompson (1963) noted that the specimens of *P. gracilis* reported from Hawaii by Rathbun (1906) are not comparable to material from the Western Atlantic.

Pontophilus talismani Crosnier and Forest, 1973

Figures 2e, 14

Pontophilus abyssi: Pequegnat, 1970, p. 112; Pequegnat et al., 1971, p. 10. [Not *Pontophilus abyssi* Smith, 1884.]

Pontophilus talismani Crosnier and Forest, 1973, pp. 245-249, fig. 80a-d.

Material examined: 1 ♀, 9.0; southwest Gulf of Mexico, off Yucatan; 22°52'N, 92°06'W; 3731 m; 20 March 1968; *Alaminos* Station 68A3-8D; benthic skimmer; TAMU 2-6184.

Diagnosis: Rostrum extremely short, reaching only to half length of cornea, armed laterally with pair of acute spines, tip acute. Middorsal surface of carapace with 3 spines, 2 gastric, 1 cardiac, and small denticle just behind first gastric spine; branchial carina with 2 spines, anteriormost minute; hepatic surface with single spine. Exopod on pereopod 1.

Distribution: Gulf of Mexico, off Mexican coast and Mississippi River Delta (Pequegnat, 1970); eastern Atlantic, between Senegal and the Cape Verde Islands (Crosnier and Forest, 1973) (see Figure 19). The Gulf specimens were taken from depths of 2,366 m to 3,731 m. The African specimens were collected at 3,200 m.

Remarks: The single specimen examined lacks the accessory spinule behind the first gastric spine and is referred to this species on the basis of the short rostrum and elongate eyes.

Figure 14. *Pontophilus talismani*, female, CL 9.0, TAMU 2-6184; whole animal, lateral view (scale equal to 5.0 mm).

Figure 15. *Sabinea tridentata*, paratype male, CL 4.0, TAMU 2-2294; whole animal, lateral view (scale equal to 5.0 mm).

Crosnier and Forest (1973) reported this species only from the type-locality but did not rule out the possibility that the specimen of *P. challengeri* from the Cape Verde Islands examined by Ortmann (1893) was, in fact, *P. talismani*.

Sabinea tridentata Pequegnat, 1970

Figures 2b, 15

Sabinea tridentata Pequegnat, 1970, pp. 115-117, figs. 4-16, 4-17; Pequegnat et al., 1971, p. 10.

Material examined: 1 ♂, 4.0; southeast Gulf of Mexico; 24°58'N, 84°17'W; 391 m; 14 July 1965; *Alaminos* Station 65A9-21; dredge; HOLOTYPE; USNM 128808. — 1 ovig. ♀, 5.0; southeast Gulf of Mexico; 24°58'N, 84°17'W; 391 m; 14 July 1965; *Alaminos* Station 65A9-21; dredge; ALLOTYPE; USNM 128809. — 1 ♂, 4.0; southeast Gulf of Mexico; 24°58'N, 84°17'W; 391 m; 14 July 1965; *Alaminos* Station 65A9-21; dredge; PARATYPE; TAMU 2-2294.

Diagnosis: Rostrum acute, armed laterally with pair of sharp spines. Carapace with 2 very weak, short lateral carinae on each side, each with single spine; spine of hepatic carina anterior to that of branchial carina; middorsal carina with 3 spines, extending entire length of carapace. Abdomen smooth except for dorsally keeled third segment.

Distribution: Known only from the type-locality in the southeastern Gulf of Mexico (24°58'N, 84°17'W) from 391 m depth (see Figure 16).

Remarks: Pequegnat (1970) notes that this species is most closely related to *Sabinea indica* DeMan, 1918, from the Indo-Pacific, the only non-Atlantic species of the genus. Minor details of her Figure 4-17 are inaccurate. Both the stylocerite and the antennule are narrower than depicted, and the antennal scale is more distinctly separated from the blade distally than shown.

DISCUSSION

SECONDARY SEXUAL CHARACTERISTICS

Sexual dimorphism is pronounced among members of the Crangonidae found in the Gulf of Mexico. Males of each species possess well-developed secondary sexual characters including a broad, thickened outer antennular flagellum and an appendix masculina on the second pair of pleopods.

The Gulf species of *Pontophilus* (with the possible exception of *P. talismani*, of which male specimens were unavailable) can also be sexed by observing either the shape or the size of the endopod of the first pleopod. In *Pontophilus gorei* and *P. brevirostris*, the lateral margins of the endopod are sinuous in males but are evenly curved to a rounded apex in females. In *P. gracilis*, where both sexes possess a lobate endopod, the endopod is nearly equal in length to the exopod of males but falls short in females. The location of the appendix interna on the endopod of the fifth pleopod is also characteristic of the sex of *Pontophilus gorei*. Mature females have the appendix interna positioned subapically on the fifth pleopod; in males, it is in the usual basal position. Additionally, the length of the endopod of pleopods 2-4 relative to that of the exopod is generally greater in males than in females of *P. gorei*.

Secondary sexual characteristics have been used to define higher taxa among the Crangonidae, including a tentative attempt by Kemp (1916) to divide *Pontophilus* into five groups according to the development of the pleopods. Because of a certain amount of intergradation (Kemp, 1916), disagreement with other characters (Lebour, 1954) and maturational differences in pleopod morphology (Dardeau, 1980), Kemp's groups are not entirely acceptable and have never been accorded formal generic or subgeneric status. Male pleopod morphology has recently been used more successfully to separate *Crangon* and *Sclerocrangon* into several genera (Zarenkov, 1965).

ZOOGEOGRAPHY

Members of the family Crangonidae are small, infaunal shrimps generally taken from the deeper waters of the continental shelf and beyond. Consequently, crangonid populations are often inadequately sampled by conventional collecting gear, and the apparent scarcity of some species

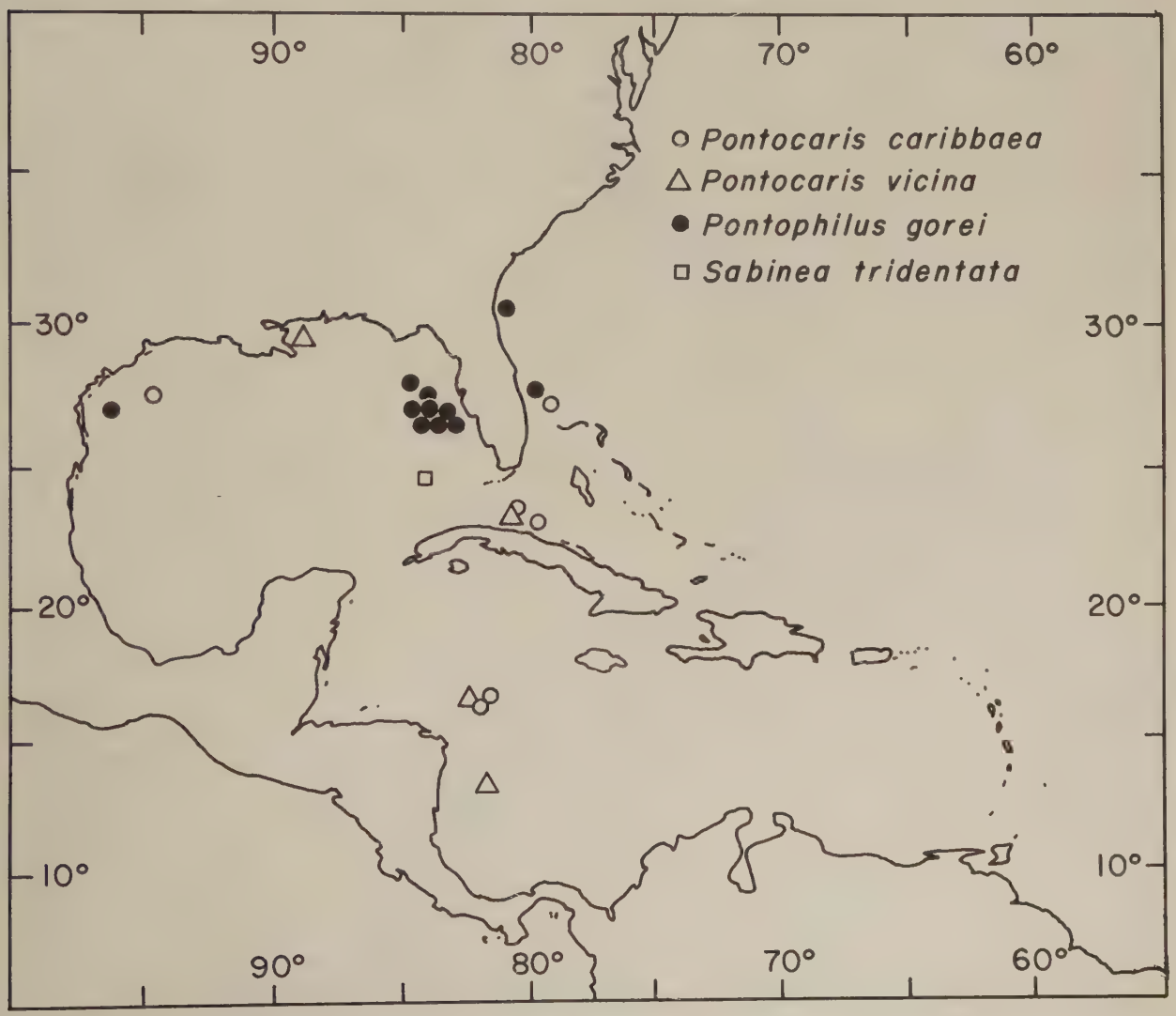

Figure 16. Distributions of *Pontocaris caribbaea*, *Pontocaris vicina*, *Pontophilus gorei* and *Sabinea tridentata* in the northwestern Atlantic and Gulf of Mexico.

is probably deceptive. Because geographic and bathymetric ranges of many species are poorly delimited, zoogeographic analysis of the Gulf of Mexico crangonids is restricted to a brief discussion of their distributional patterns.

Distributions of the Western Atlantic Crangonidae, including those from the Gulf of Mexico, are summarized in Table 2. Figures 16-19 chart the geographic distributions of the species treated in this report, and ranked bathymetric ranges of Gulf species are depicted in Figure 20.

Three of the Gulf species exhibit rather restricted tropical distributions. *Pontocaris vicina* and *P. caribbaea* have not been taken north of the Bahama Islands or south of Nicaragua. *Sabinea tridentata* is known only from the type series from off southwest Florida and is the only crangonid presently known exclusively from the Gulf. All three species are from moderately deep water on the upper continental slope.

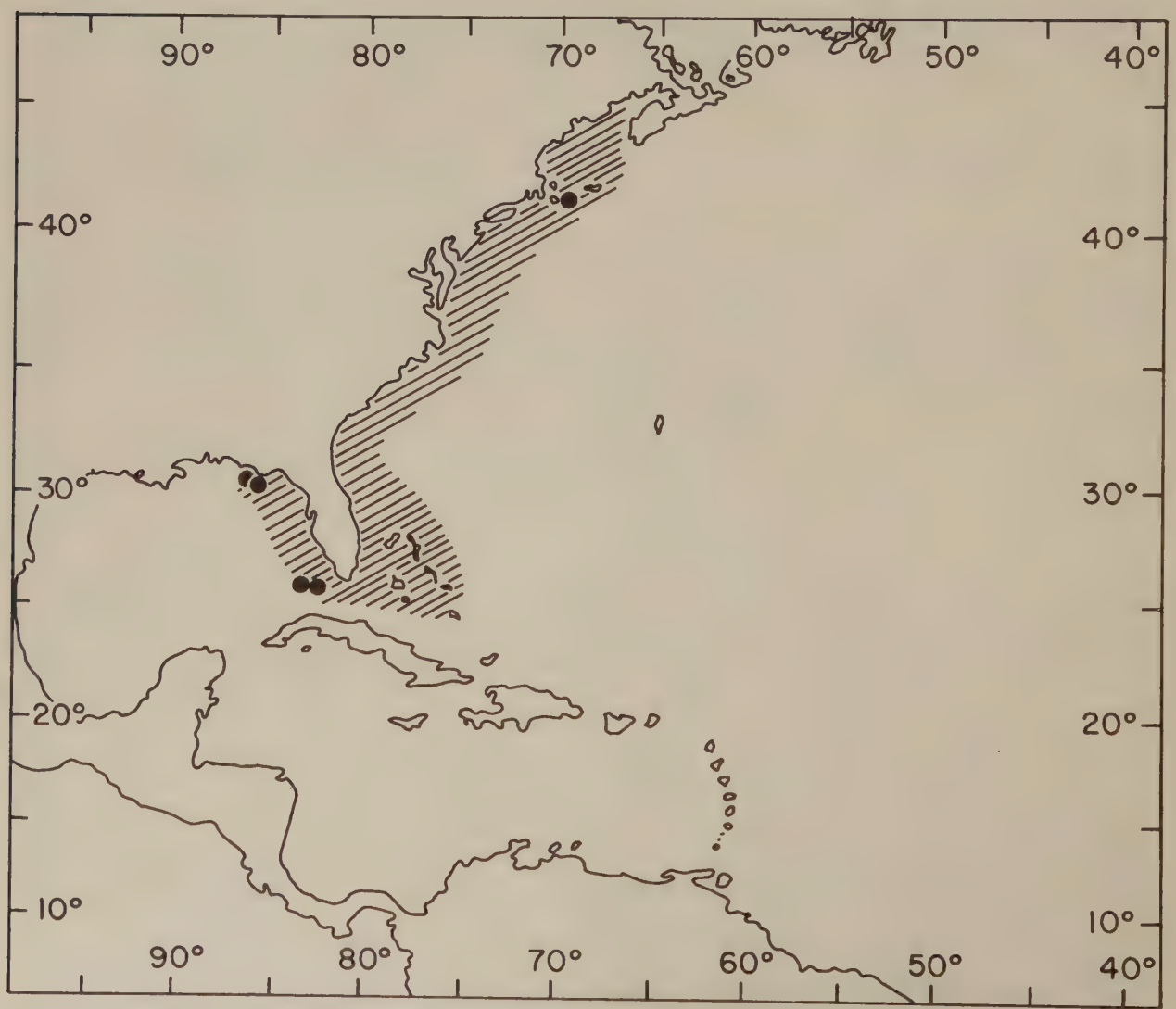

Figure 17. Distribution of *Pontophilus brevirostris* in the northwestern Atlantic and Gulf of Mexico (shaded area is reported distribution; circles represent material examined).

Figure 18. Distribution of *Pontophilus gracilis* (shaded area is reported distribution; circles represent material examined).

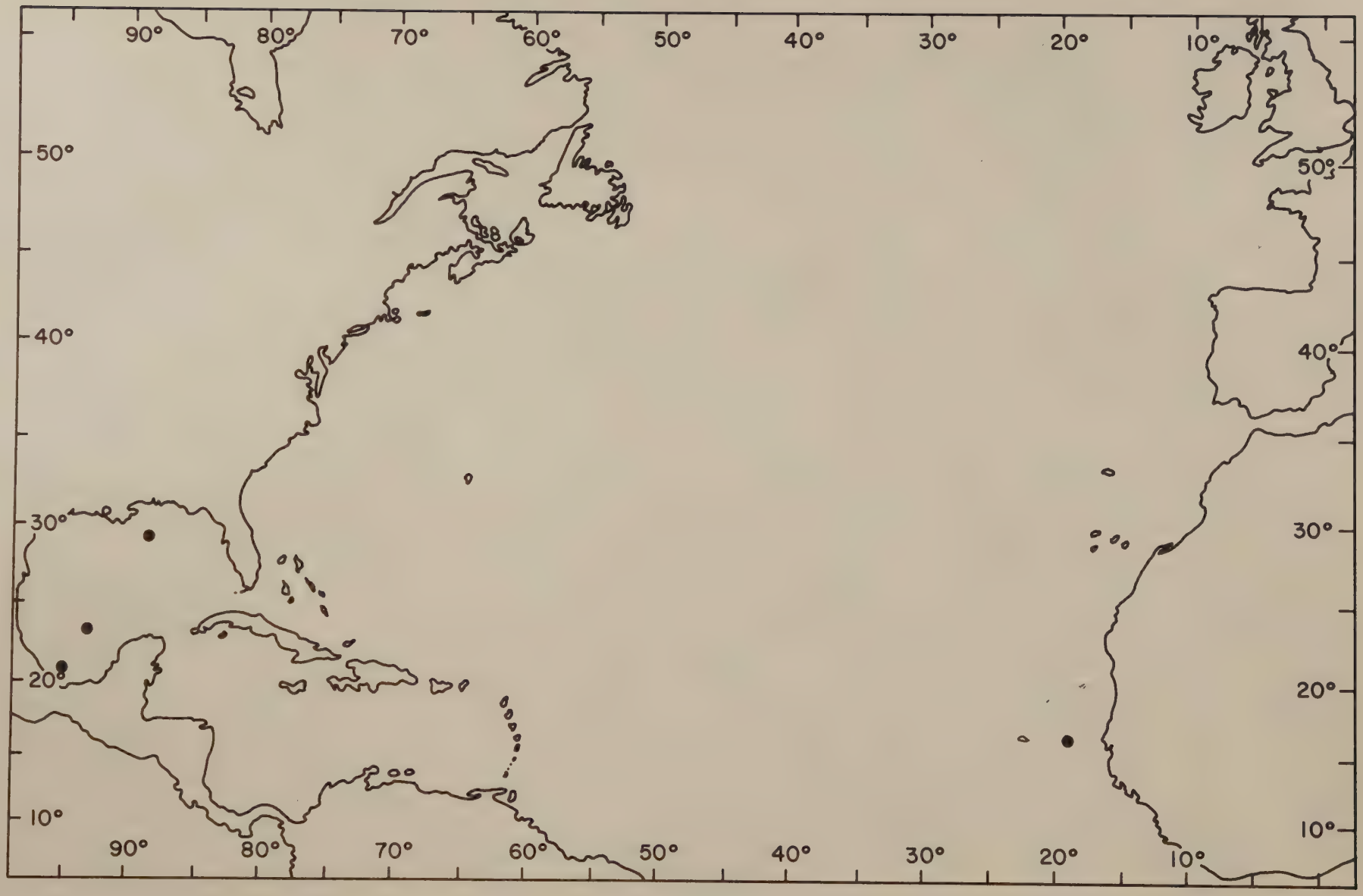

Figure 19. Distribution of *Pontophilus talismani* in the North Atlantic and Gulf of Mexico.

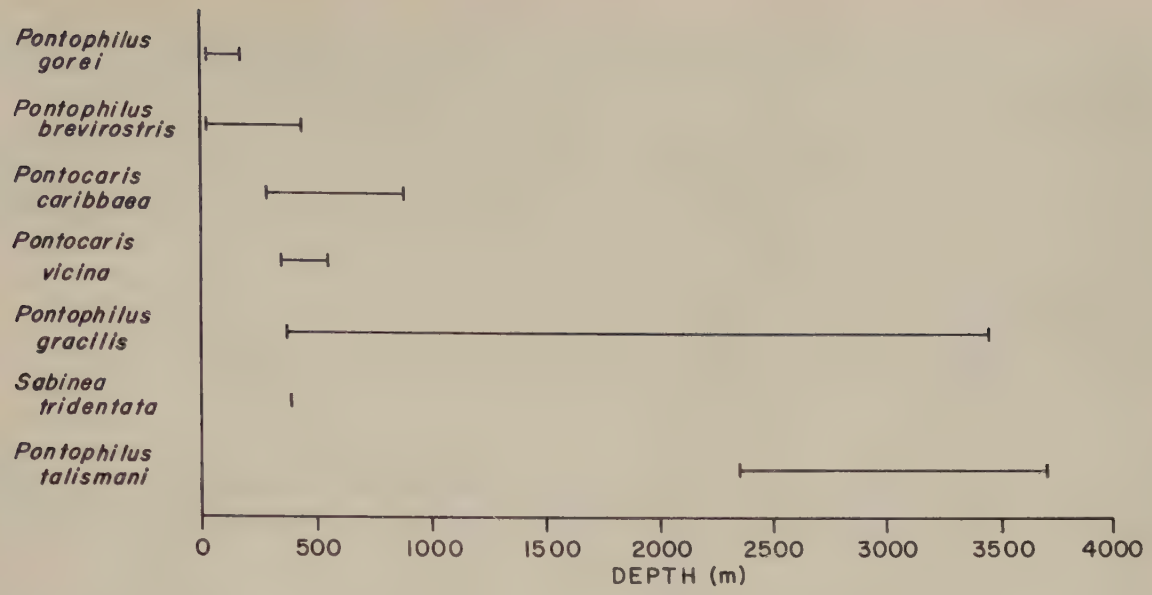

Figure 20. Ranked bathymetric ranges of seven Gulf of Mexico crangonids.

The two Gulf species of *Pontophilus* restricted to the Western Atlantic share a subtropical to temperate distributional pattern. *Pontophilus gorei* ranges north from the Gulf of Mexico to at least as far as Georgia, while *P. brevirostris* is distributed from the Gulf of Maine southward into the Gulf of Mexico. These two species, along with several others whose southern ranges include warm-temperate and subtropical regions but not the Gulf of Mexico (*Crangon septemspinosa*, *Metacrangon jacqueti agassizii*, *Pontophilus abyssi* and *Sabinea hystrix*), bridge the gap between the crangonids with more exclusively boreal distributions and the tropical species discussed above. *Pontophilus brevirostris* ranges bathymetrically from the upper continental slope to well up onto the continental shelf. *Pontophilus gorei* seems to be restricted to relatively shallow shelf depths.

The two remaining Gulf species of *Pontophilus* are more widely distributed. *Pontophilus talismani* is known from the Gulf of Mexico and from the type-locality near the Cape Verde Islands in the Eastern Atlantic. The distribution of *P. gracilis* is almost cosmopolitan, with the majority of reports from tropical regions. Significantly, these two wide-ranging species are found at greater depths than any other Gulf species.

In summary, of the seven species known from the Gulf of Mexico, one is tropical amphi-Atlantic, one is nearly cosmopolitan, two are tropical Western Atlantic, two are warm-temperate Western Atlantic and one is known only from the type-locality in the Gulf of Mexico. By comparison, four of the other Western Atlantic crangonids are circumboreal, three are boreal amphi-Atlantic, two are cosmopolitan (*Metacrangon jacqueti agassizii* is included in this category, although different subspecies are found in the Eastern Atlantic and Indo-Pacific Oceans) and one is known only from the type-locality in the Caribbean. Two western Atlantic species whose ranges include the Caribbean (*Sabinea hystrix* and *Prionocrangon pectinata*) have not yet been reported from the Gulf, but their presence in the Gulf would not be unexpected. Although the distributional patterns of Gulf crangonids differ from those of Western Atlantic species with more northern biogeographic affinities, they are typically diverse and wide ranging. The tropical nature of the Gulf of Mexico deep-sea crustacean fauna is discussed in more detail by Pequegnat et al. (1971).

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